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1926-1929

TWELFTH ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH OF MASSACHUSETTS

REPORT OF THE PUBLIC HEALTH COUNCIL.

At the end of the fiscal year closing November 30, 1926 the State Department of Public Health was constituted as follows:

Commissioner of Public Health GEORGE H. BIGELOW, M.D.

PUBLIC HEALTH COUNCIL.

RICHARD P. STRONG, M.D., 1929. GORDON HUTCHINS, 1928.¹
JAMES L. TIGHE, B.A.Sc., C.E., 1929. SYLVESTER E. RYAN, M.D., 1928.
JEROME I. LEE, M.D., 1927. FRANCIS H. LALLY, M.D., 1927.

During the year sixteen formal meetings of the Department were held, as well as meetings of standing committees. The standing committees of the Council are as follows:

SANITARY ENGINEERING (INCLUDING HOUSING AND RURAL HYGIENE).

Mr. Tighe, Dr. Bigelow and Mr. Hutchins.

PREVENTIVE MEDICINE AND HYGIENE.

Drs. Lee, Bigelow, Lally, Ryan and Strong.

FOOD AND DRUGS.

Drs. Lally and Ryan and Mr. Hutchins.

LABORATORY WORK AND RESEARCH.

Drs. Strong and Bigelow and Mr. Tighe.

PUBLICATIONS.

Drs. Lally and Ryan and Mr. Tighe.

The Committee on Sanitary Engineering has met prior to the meeting of the Public Health Council regularly, as is customary, and has considered in detail all matters coming before the Department having to do with water supplies, sewage disposal and sanitation generally, subsequently submitting recommendations thereon to the Public Health Council.

As provided by statute the Department has held fourteen public hearings on plans for sewerage and sewage disposal, taking of lands for the protection of public water supplies and contracts pertaining to county tuberculosis hospitals. The Public Health Council has considered and approved appointments submitted to it by the Commissioner as required by law, and has also considered and given advice relative to various matters submitted to it by the Commissioner arising in connection with the activities of the Department.

As directed by Chapter 391 of the Acts of 1926 the Department has conducted certain investigations and prepared a plan which in the opinion of the Department offers most in the way of benefit both to the individual afflicted with cancer and to the Commonwealth, and a report of the study and plan has been submitted.

Chapter 39 of the Resolves of 1926 directed the Department to investigate the water supply needs and resources of the municipalities of the County of Essex and adjacent portions of the County of Middlesex. This study was made as directed and report has been submitted.

Under authority of Chapter 43 of the Resolves of 1926 an investigation was made by the Department relative to the extension of the Metropolitan sewerage system in the Neponset Valley and the cost thereof, and the report of this investigation has also been prepared and submitted.

The Public Health Council visited the territory included in the investigation of the water supply needs and resources of the municipalities of Essex County and also visited the Neponset Valley in connection with the investigation which was made relative to the extension of the Metropolitan sewerage system to that area. The members of the Public Health Council also attended the exercises held at the

¹ Appointed July 9, 1926.

opening of the Lakeville State Sanatorium for the care of non-pulmonary cases of tuberculosis.

At a meeting of the Department on January 11, 1927 the Commissioner of Public Health presented to the Council a report of the activities of the Department for the fiscal year 1926 and it was voted that this report, together with the foregoing brief summary of the doings of the Public Health Council, be approved and adopted as the report of the State Department of Public Health for the year 1926.

TWELFTH ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC HEALTH.

To the Public Health Council:

GENTLEMEN:— I have the honor to submit herewith my annual report for the fiscal year ending November 30, 1926.

CANCER.

The most significant development in the activities of the Department is that during the past year, at the direction of the Legislature (Chapter 391, Acts of 1926) a cancer program has been instituted. Communicable diseases have long been considered the principal interest of official health agencies. Exceptions to this have been accumulating in late years with the development of service in child hygiene, nutrition, prenatal and infant hygiene, dental hygiene, the identification and elimination of defects in school children, as well as in adults, through the health examination. In the field of cancer the Department in cooperation with the Harvard Cancer Commission has for the past five years offered pathological service to the doctors and hospitals in the State. But to develop an entire program for a specific non-communicable disease, such as cancer, is a new step.

With the passage of this legislation the Department appointed an Advisory Cancer Committee which has served generously, particularly in regard to the initial steps. From this general committee four sub-committees were appointed as follows:

Committee on Cancer Clinics: Dr. Robert B. Greenough, Chairman, Drs. Franklin G. Balch, Kendall Emerson, James S. Stone, G. Forrest Martin, P. E. Truesdale, and Mr. Robert W. Kelso.

Committee on Hospitalization: Dr. Henry M. Pollock, Chairman, Dr. Stephen Rushmore, Mr. Richard K. Conant, Rev. George P. O'Connor, Miss Ida M. Cannon, and Representative S. H. Wellman.

Committee on Cancer Education: Mr. Robert W. Kelso, Chairman, Rev. George P. O'Connor, Miss Ida M. Cannon, Mrs. Edith R. Avery, Miss Florence M. Patterson, Dr. Shields Warren, and Dr. Franklin G. Balch.

Committee on Cancer Studies: Professor Edwin B. Wilson, Chairman, Dr. J. W. Schereschewsky, Dr. Walter P. Bowers, Miss Gertrude W. Peabody, Dr. E. E. Tyzzer, Dr. Edwin H. Allen, Representative W. J. Bell, and Dr. Francis George Curtis.

As the above indicates, there are four phases to the work.

Cancer Hospital.— The Norfolk State Hospital will be open for ninety patients soon after additional funds are available to complete the renovations. Thirty of the beds will be for ambulatory patients and these should largely be filled from the clinics with patients for diagnosis and treatment. In addition to the resident staff, a consultative staff will be a most important factor.

Cancer Clinics.— Through money, forms and advice the Department is aiding local communities to institute cancer clinics in their general hospitals. Medical and lay cancer committees are appointed to handle the professional, educational, and social aspects of the problem. The Medical Committee is appointed by the local medical profession. Newton has already opened such a clinic and others are pending in six communities. The closest relationship must exist between these clinics for early recognition of the disease and our Cancer Hospital.

Cancer Education.— Through a group of physicians as speakers and through printed matter the gospel of early recognition and places where service can be obtained must be spread. Special aid must be given communities with clinics so that resources will be fully utilized.

Cancer Studies. — A further report of studies of hospital resources and needs in regard to cancer has been made to the Legislature. Through the case reporting which has been instituted in Newton, the data which many visiting nursing associations are collecting, as well as the considerable unanalyzed data already at hand, we will have material not heretofore available in regard to cancer.

From all the above we must determine further steps, not only in combating this disease but in the other degenerative diseases in which prevention, if it is soundly practical, should be instituted.

DISEASE PREVALENCE.

This year has shown a marked increase in reported disease of about 8 per cent. As last year, the increase is largely in measles, whooping cough and influenza. This situation was predicted last year, since in the fall an increase of these diseases was noted. The most notable decrease in disease is found in diphtheria which dropped about 25 per cent over last year and established a low point for the State.

The ever-present danger of disease spread by food has been sharply emphasized last year through scarlet fever and typhoid fever. An obvious method of prevention is the routine physical and laboratory examination of all persons coming in contact with food. If all persons harboring the germs of disease are recognized before their contact with food prevented, control should be effective. Such medical and laboratory supervision is given at certain certified dairies. But it means constant trained oversight, is expensive, and is not fool proof. Figures are impossible to obtain but probably between half a million and a million persons in the State either constantly or intermittently are engaged in the producing, packaging, transporting, retailing, cooking or serving of food. An examination sufficiently detailed and at sufficiently frequent intervals to recognize persons harboring the organisms of typhoid, diphtheria, septic sore throat, scarlet fever, and tuberculosis, and yet sufficiently simple to be practical is no easy task. Certain cities have attempted it with indifferent results. Again, in the last twenty years the amount of disease traced to milk has fallen from an average of about 1,000 cases a year to 100, and this without any wholesale supervision of the health of the milkers. Also there is danger that such an obvious protective measure as the medical examination of handlers will give a false sense of security and perhaps decrease vigil in general cleanliness of handling, supervision of animal health, and in the application of heat through cooling or pasteurizing which is probably the greatest of all single protective barriers. For these multiple reasons the Department has in the past opposed legislation for compulsory examination of all food handlers. But from the vivid experiences of this year some further protection is imperative. This might take the form of compulsory examination of milk handlers, since milk is a food particularly vulnerable to infection, or compulsory pasteurization of all milk. But with the Department's bill still pending in the Legislature requiring that only pasteurized milk or milk from non-tuberculous cattle be sold in the State, the protection afforded by an annual examination would seem the most likely of enactment into law though it is doubtful if the return in protection would be commensurate with the effort.

The question of what is a "killing" disease has been asked. This last year one out of every one and one-half cases of reported tetanus died. For other diseases the figures in round numbers were as follows:

Disease.	Ratio of Deaths to Cases.
Typhoid fever	1 to 10
Diphtheria	1 to 14
Whooping cough	1 to 29
Measles	1 to 81
Scarlet fever	1 to 100
Chicken pox	1 to 1,183

When we find that the total deaths from tetanus, scarlet fever, typhoid, and diphtheria were 435, while the deaths from whooping cough and measles were 404 and 367 respectively, these two latter diseases are more killing as far as the general public is concerned. This emphasizes the need of advances in methods of treatment and even more of prevention of these diseases, as we have in diphtheria, and are acquiring in scarlet fever; and further it emphasizes the need of impress-

ing on parents a respect for measles and whooping cough as "killing" diseases, such as they very generally have now for diphtheria and scarlet fever.

Individual consideration of certain of the diseases is indicated:

Diphtheria. — The continued fall in diphtheria, which began the latter part of 1924, is the most striking communicable disease event of the year. The total cases, 3,401, mark a low point for the State. The rate of 80.6 per 100,000 population is the lowest in the last twenty-five years. But five years ago the rate was 231. However, during the autumn there has been a definite increase and unless immunization with toxin-antitoxin is pushed among the school and pre-school children we must expect a compensatory increase in this disease. A study of the entire diphtheria situation is being made by the Department as a basis for rationally furthering immunization. In the meantime, the demand for toxin-antitoxin this fall exceeds any previous period.

Typhoid Fever. — In spite of the fact that this fall there were three milk-borne outbreaks of this disease, both the case and the death rate mark a low point for the State. These three outbreaks account for 91 cases and 4 deaths up to the end of the year. Two of these were due to cases and one to a carrier. Two were raw milk sources and one supposedly in a pasteurized milk which was evidently infected during the bottling. On the other hand, there is some evidence that raw milk was supplied from this pasteurizing plant to customers in the immediate vicinity. The location of the cases would support this explanation. This emphasizes that pasteurization must be supervised as well as the cleanliness of milk handling. Also, there is need of authority for restraining carriers when cooperation cannot be obtained. Further reduction of the autumn cases, which have been called "vacation typhoid", can be aided by camp supervision, shellfish control, and extending the habit of protective inoculations. The increasing demands on local water supplies associated with below-average rainfall are conducive to increasing infection unless constant vigil is maintained.

Smallpox. — The only four cases in the State came by automobile from Florida and illustrate how vulnerable we are to inroads of infection from outside. Those in the machine who did not have the disease were those who had been vaccinated. To continue the record of the last two years of no smallpox deaths, the protection afforded by vaccination must be extended. The extending of compulsory vaccination to the private schools would be a definite step in this direction.

Influenza. — In March and April there was a high incidence of this disease reported, practically doubling the cases for last year. That it was mild is indicated by the fact that there was only a 40 per cent increase in deaths. A study of the influenza records for Massachusetts¹ lead to the conclusion that there would be an increase in respiratory disease this winter. Fortunately this has not as yet materialized.

Anterior Poliomyelitis. — Springfield and Worcester had a high incidence this year, 22.4 cases per 100,000 population, while for the rest of the State the rate was 4.3. Through a cooperative arrangement with the Harvard Infantile Paralysis Commission, Dr. Arthur P. Black made epidemiological studies of cases during the summer and fall, as well as giving clinical service to the physicians. This arrangement will be continued next year.

Gonorrhea and Syphilis. — There has been a decrease in the number of cases reported, the decrease being about 11 per cent for syphilis and 5 per cent for gonorrhea. Whether this means less infection or less willingness to report to local boards than to the Department as was done previously, we cannot say. The demand for arsenicals has increased. We hope this year to study the actual incidence of the disease in relation to reporting.

The educational program developed by the Social Hygiene Committee of the League of Women Voters in cooperation with the American Social Hygiene Association and this Department is in its second year. Dr. Helen I. D. McGillicuddy, as Executive Secretary, is in constant demand for study groups, and the results of these groups has actually been felt in certain of the clinics. The full effect of such education cannot, of course, be known for years, if ever.

¹ Doering and Lombard, Boston Medical and Surgical Journal, Vol. 195, pages 405-410, 1926.

THE TEN-YEAR JUVENILE TUBERCULOSIS PROGRAM.

The second year of the State clinics for examining the underweight, contact, and "problem" children in the schools was the school year 1925-26. 19,073 children were examined. The results show surprisingly little variation from the 19,648 examined the year before. 28.5 per cent reacted to tuberculin, which was precisely the figure for last year. The reactors were X-rayed and the findings for the two years were:

	1924-25	1925-26
Pulmonary Tuberculosis — Active and Latent	0.29%	0.33%
Hilum Tuberculosis — Active and Latent	5.00%	3.30%
Suspicious Cases	10.00%	7.00%

By the end of the present school year about three-quarters of the school population will have been gone over. As time goes on the re-examinations will be more and more valuable since they will show precisely what has been accomplished by various treatments instituted.

Further details are given in the report of the Division of Tuberculosis.

It is, however, worth pointing out in connection with the Department's legislation requiring that all milk should be either pasteurized or from non-tuberculous animals that the rural children show more infection than urban children. Infected cervical glands have consistently shown a high percentage of bovine infection. Eleven per cent of the rural "reactors" had infected cervical glands, while but 6.3 per cent of the urban "reactors" had such glands. Although both groups showed about the same percentage of total "reactors" if the contact "reactors" (*i.e.*, the children showing a positive reaction that are known to be in contact with a case of tuberculosis and whose infection, therefore, is most likely to be human) are deducted, the rural group showed almost 50 per cent more "reactors" than the urban. Although these series are small they indicate that in the country where there is less supervision of milk supplies and less access to pasteurized milk there is more milk-borne tuberculosis.

TUBERCULOSIS SANATORIA.

Westfield and North Reading. — These two institutions are exclusively for children, the former with 310 beds, the latter with 200 beds. Since the cities and counties have responded to the demands made evident by the clinics to a greater degree than had been expected, these two institutions are not full to capacity. As long as this condition exists, women will be admitted from the waiting list at Rutland and probably some bed cases among the men. It has not been found desirable to have ambulatory men patients in children's institutions. Westfield needs a new building for women employees and North Reading a new service building or at least a remodeling of the present one. As usual, it is easier to get new beds than it is to get the additions necessary to give adequate service to the patients occupying these beds.

Lakeville. — On April 27th the institution was formally opened for non-pulmonary tuberculosis with exercises at which His Excellency the Governor was among the speakers. The children's ward had been open for some time, the women's ward was then opened, and renovation of the men's ward was finished in July. Since service to these patients will average a number of years, the two hundred beds will soon not be adequate for the demands. Certain relief has been found in moving some cervical gland cases to the children's institutions. The combination of sun treatment with skillful orthopedic supervision, under the direction of Dr. Z. B. Adams as Consultant, has already shown some excellent results. The pressing need is a medical building with operating facilities.

Rutland. — This institution has been fully occupied throughout the year and there has been a considerable waiting list. About 250 of the 350 beds are occupied by patients from Worcester and Middlesex Counties and the Hospital District of Chelsea, Revere and Winthrop, which communities are served by contract. Since a considerable number of the cases coming in under contract are advanced cases it was decided to reserve the other one hundred beds for hopeful cases in order that the institution should not get a bad reputation. This was effected through the requirement that all applicants not coming under the contracts should be examined by one of our sanatoria staff, or, if in Boston, at the Out-Patient Depart-

ment of the Boston Sanatorium. This latter arrangement has been a great help to us. As has been said, for the present at least, relief for the Rutland waiting list can be had at Westfield and North Reading. The immediate building need for Rutland is a women employees' building.

THE HEALTH OF THE CHILD.

Education. — The very happy relations which exist between this Department and that of Education is further shown by two cooperative projects this last year, one a course in the rudiments of personal hygiene for immigrants and the other a course for mothers in maternal and infant hygiene as a part of the University Extension service.

Well Child Conferences. — These conferences have been held in fifty-nine cities and towns. The object is to demonstrate what constitutes service to well children, to the end that permanent clinics will be established by the communities.

Dental Hygiene Policy. — After careful consideration with the Dental Hygiene Advisory Committee, a policy was promulgated by the Department. The feature of this is that attention should be focused on the first, third and sixth grades, at which times the first molars, bicuspid, and twelve-year molars are erupted. Attention to fissures at these times will have lasting effect. The filling of teeth as conventionally done is a surgical procedure with little relation to prevention and should be the responsibility of the parent, the family dentist, and dental dispensary maintained under private auspices rather than the public agency.

SANITARY PROBLEMS.

Adequate supervision and extension of public water supplies which serve 96 per cent of the inhabitants of the Commonwealth is still the major sanitary problem. Although legislation was passed at the last session for extending the Metropolitan water supply it will be some years before this can be accomplished. With the Wachusett Reservoir over 30 feet below high water, a serious shortage might be experienced toward the end of the year should the rainfall in 1927 be as low or lower than in the last two years. It is, therefore, essential that provision be made as soon as practicable for increasing the supply by the use of emergency services.

These same factors of increased consumption and decreased rainfall are taxing other supplies severely. The legislative study of the water needs of communities in Essex County and adjacent portions of Middlesex County showed quite clearly that any solution must depend on group action of the communities involved.

These conditions are reflected in the increased number of applications for advice which the Department has received as well as in the increased number of samples examined in our Water and Sewage Laboratories, which is this year over 16,000.

An excellent piece of work has been done in continued supervision, certification, and posting of shellfish-bearing waters under Chapter 370 of the Acts of 1926. The Department of Conservation, through its Division of Fisheries and Game, has had an appropriation to enforce this act and has done so to the end that probably there never were so few sewage-infected clams on the market as at present. But should this supervision cease through lack of appropriation the typhoid menace from these shellfish will be as great or greater than ever.

The 125 summer camps examined show need of further supervision in a few instances, and this is being asked in legislation.

The menace of the cross-connection in industry has been shown in two instances and the entire situation throughout the State will be studied this year.

PERSONNEL.

A number of important changes in personnel have occurred. With each change the aim has been to get a closer-knit organization of somewhat fewer people somewhat better paid. In this way about \$20,000 has been saved in salaries this year. It is to be hoped that the early indications from the reclassification study now in progress will actually result in certain material increases in salary.

Mr. Gordon Hutchins was appointed on July 9, 1926, by the Governor and Council to fill the vacancy on the Public Health Council created by the death of Mr. Warren C. Jewett. He brings to the Public Health Council the experience of

the practical farmer and has been appointed as the representative of this Department on the Reclamation Board.

Dr. Clarence L. Scamman was appointed Director of the Division of Communicable Diseases and Deputy Commissioner on April 1, 1926.

With much regret the resignation of Dr. Sumner H. Remick as Director of the Division of Tuberculosis (Sanatoria) was accepted on April 24, 1926, and Dr. Henry D. Chadwick was appointed as Acting Director on April 17, 1926.

Mr. Merton P. Young was transferred on January 1, 1926, from Assistant Director of the Division of Tuberculosis (Sanatoria) to Assistant Director of the Division of Administration and Dr. David Zacks was appointed Assistant Director of the Division of Tuberculosis (Sanatoria) on May 1, 1926. With the appointment of a medical Assistant Director the position of Supervisor of Nurses in the Division of Tuberculosis (Sanatoria) was abolished and on September 1, 1926, the services of Miss Cecilia A. Lemner, who formerly held this position, terminated.

Dr. Herbert L. Lombard was appointed epidemiologist on cancer on July 1, 1926.

Dr. Mary R. Lakeman resigned as Assistant Director of the Division of Hygiene and was appointed epidemiologist on cancer on August 16, 1926.

Dr. Edward A. Lane was appointed Acting District Health Officer on August 2, 1926.

Dr. Filip C. Forsbeck was appointed epidemiologist in the Division of Communicable Diseases on November 1, 1926.

The organization of the Department is as follows:

Commissioner of Public Health George H. Bigelow, M.D.

PUBLIC HEALTH COUNCIL.

George H. Bigelow, M.D., *Chairman*. 1

Roger I. Lee, M.D. Francis H. Lally, M.D.

Richard P. Strong, M.D. James L. Tighe, C.E.

Sylvester E. Ryan, M.D. Gordon Hutchins 6

Division of Administration (including Cancer):

Assistant Director, Secretary, Epidemiologists (2), Clerks and Stenographers — business office (3), cancer (4), general (7). 18

Division of Communicable Diseases:

Clarence L. Scamman, M.D., Director and Deputy Commissioner.

District Health Officers (6), Acting District Health Officer (1), Epidemiologist (1), Clerks and Stenographers (4).

(Venereal Disease):

Social Worker (1), Investigator (1), Lecturer (1), Stenographers (2).

(Diagnostic Laboratory):

Bacteriologists (4), Laboratory Assistant (1), Clerk (1).

(Distribution of Biological Products and Diagnostic Outfits):

Clerk (1), Laborers (6). 31

Division of Sanitary Engineering:

X. H. Goodnough, C.E., Director and Chief Engineer.

Engineers and Assistant Engineers (7), Sanitary and Engineering Assistants (10), Clerks and Stenographers (8). 26

Division of Water and Sewage Laboratories:

H. W. Clark, Director and Chief Chemist.

Chemists and Bacteriologists (9), Laboratory Assistants (3), Clerks and Stenographers (2), Laborers (2). 17

Division of Food and Drugs:

Hermann C. Lythgoe, S.B., Director and Chief Analyst.

Chemists (5), Veterinary Inspectors (3), Food Inspectors (5), Clerks and Stenographers (6), Laboratory Assistant (1), Laborers (2).

(Arsphenamine Laboratory):

Chemist (1), Laboratory Assistants (5), Laborers (2). 31

Division of Biologic Laboratories:

Benjamin White, Ph.D., Director and Pathologist.

(Antitoxin and Vaccine Laboratory):

Assistant Director (1), Bacteriologists (6), Stenographers (2), Laboratory Assistants (5), Laborers (19).

(Wassermann Laboratory):

Assistant Director (1), Bacteriologist (1), Clerks and Stenographers (4), Laboratory Assistants (2), Laborers (2).

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Division of Hygiene:

Merrill E. Champion, M.D., Director.

Clinic Physician (1), Assistants in Hygiene (3), Assistant in Dental Hygiene (1), Instructors (2), Clerks and Stenographers (7).

(Maternal and Infant Hygiene):

Physician (1), Nurses (2), Assistants in Hygiene (3), Clerks and Stenographers (5).

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Division of Tuberculosis (Sanatoria):

Henry D. Chadwick, M.D., Acting Director.

Assistant Director (1), Nurses (7), Examiner of Legal Settlements (1), Supt. of Construction (1), Clerks and Stenographers (7).

(Clinic Units):

Physicians (6), Nurses (2), Field Agent (1), X-ray technician (1), Clerks and Stenographers (6).

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Total	234
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The names and districts of the District Health Officers are:

First or Southeastern Health District	Dr. Richard P. MacKnight
Second or Eastern Health District	Dr. George T. O'Donnell
Third or Northeastern Health District	Dr. Lyman A. Jones
Fourth or North Midland Health District	— — — —
Fifth or Worcester Health District	Dr. Oscar A. Dudley
Sixth or Connecticut Valley Health District	Dr. H. E. Miner
Seventh or Berkshire Health District	Dr. Leland M. French

The following are the Superintendents of the four State Sanatoria which are under the Division of Tuberculosis (Sanatoria):

Rutland State Sanatorium	Dr. Ernest B. Emerson
Westfield State Sanatorium	Dr. Henry D. Chadwick
North Reading State Sanatorium	Dr. Carl C. MacCorison
Lakeville State Sanatorium	Dr. Leon A. Alley

NEW LEGISLATION.

Again the Department is asking for important milk legislation. We are also asking authorization for licensing pasteurizing plants, summer and recreation camps, and shellfish handling establishments. The bills are entitled:

An Act relative to the sale of milk.

An Act relative to the delivery and receipt of tuberculin.

An Act relative to the pasteurization of milk.

An Act relative to the manufacture, distribution, sale and commercial use of cosmetics.

An Act relative to the shucking, marketing and transportation of shellfish.

An Act to provide for the purchase of radium by the Commonwealth to alleviate distress caused by cancer.

An Act relative to the reimbursement to cities and towns for care of persons ill with tuberculosis.

An Act regulating the operation of recreation, health and tourists' camps.

An Act relative to charges at the Norfolk State Hospital.

An Act relative to the control of "typhoid carriers".

An Act relative to the support of inmates of State sanatoria.

Appropriations and Expenditures for the Year ended November 30, 1926.

	Appropriations.	Expended.
Division of Administration	\$31,545 00	\$29,849 61
Division of Hygiene	47,750 00	46,671 08
Maternal and Infant Hygiene	35,400 00	33,394 19
Division of Communicable Diseases	68,250 00	64,212 92
Venereal Diseases	30,370 00	27,631 95
Manufacture and Distribution of Arsphenamine	14,250 00	14,085 42
Division of Food and Drugs	51,100 00	48,377 84
Division of Biologic Laboratories:		
Antitoxin and Vaccine Laboratory	76,500 00	75,088 81
Wassermann Laboratory	18,100 00	17,605 08
Division of Tuberculosis	47,080 00	39,253 20
Subsidies to cities and towns	225,000 00	224,992 22
Tuberculosis Clinic Units	74,800 00	58,953 13
Division of Sanitary Engineering	63,500 00	58,393 61
Division of Water and Sewage Laboratories	41,100 00	41,063 77
	<u>\$824,745 00</u>	<u>\$779,572 83</u>

Special Appropriations and Expenditures for Year ended November 30, 1926.

	Appropriation.	Expended.
Neponset Valley Sewage Disposal, Ch. 43 — Acts 1926	\$7,500 00	\$4,420 91
Essex County Water Supply, Ch. 39 — Res. 1926	8,000 00	7,812 38
Shellfish Control, Ch. 370 — Acts 1926	5,000 00	3,074 76
Cancer Clinics, Ch. 391 — Acts 1926	15,000 00	9,762 81
Norfolk Hospital, Ch. 391 — Acts 1926	100,000 00	49,720 38
	<u>\$135,500 00</u>	<u>\$74,791 24</u>

1926 Expenditures from Balance of Special Appropriation of Previous Year.

	Balance of 1925 Appropriation.	Expended.
Shellfish Control, Ch. 300 — Acts 1925	\$3,130 76	\$1,006 35

GEORGE H. BIGELOW, M.D.,
Commissioner of Public Health.

MASSACHUSETTS STATISTICS FOR 1926.

Estimated population	4,213,693
Death rate per 1,000 population	12.6
Infant mortality	73.4 per 1,000 live births

REPORT OF THE DIVISION OF SANITARY ENGINEERING.

X. H. GOODNOUGH, *Director and Chief Engineer.*

OVERSIGHT AND CARE OF INLAND WATERS.

Water Supply and Sewerage.

The number of applications for the approval of plans for systems of water supply, drainage and sewerage, and for advice relative thereto, has increased steadily in the years since the close of the war, and the year 1926 has proved no exception to this rule. The total number of applications and petitions received during the year aggregated 322, of which 239 related to water supply, 5 to sources of ice supply, 37 to sewerage and sewage disposal, 9 to pollution of streams, and 32 to miscellaneous matters. A new water supply was introduced during the year in the town of Lynnfield by means of an extension of the water supply system of the city of Lynn to portions of that town. The total number of cities and towns supplied with water from public works during the year was 219 out of a total of 355 cities and towns in the State.

The rainfall for the year 1926 in the State as a whole as deduced from 8 stations in different parts of the State having records of 50 years or more was about 4.58 inches less than the normal. The deficiency was quite general throughout the State except in the southeastern portion, where it was slight. The rainfall exceeded the normal in the months of February, October and November and was deficient in all of the other months, the deficiency being comparatively slight in July, August and December.

The rainfall on the watershed of Wachusett Reservoir which is approximately in the central part of the State was 39.31 inches, or 5.74 inches less than the average for the past 30 years, which has amounted to 45.05 inches. The average flow from the watershed during the year was 826,000 gallons per square mile per day, or 255,000 gallons per day less than the average for the past 30 years, which has amounted to 1,081,000 gallons per square mile per day.

In consequence of the deficiency in rainfall and the increasing consumption of water in the Metropolitan Water District and demands upon the Metropolitan system for emergency supplies, Wachusett Reservoir was drawn down to a level of 363.24 feet or about 32 feet below the normal and 10.2 feet below the level at the end of 1925. Notwithstanding the low level to which the water has been drawn, the usual excellent quality of the water has been maintained throughout the year.

Metropolitan Water Supply.

After the consideration of various plans for enlarging the water supply of the Metropolitan Water District the Legislature at its session of 1926 adopted without modification the plan recommended by the Department of Public Health and a majority of the Metropolitan District Commission in their report to the Legislature of 1922 which was printed as House Document 1550 of that year. By the enactment of Chapter 375 of the Acts of the year 1926 the Legislature provided for the appointment of a commission to be known as the Special Metropolitan District Water Supply Commission and directed it to construct a tunnel to the Ware River at Coldbrook Springs, to acquire property and water rights in the valley of the Swift River for the further extension of the system to include the Swift River and to provide for the construction of the proposed great reservoir within the watershed of that stream. This act, which requires the construction of the works in accordance with the Joint Board plan, was signed by the Governor on May 29, 1926, and the commission was subsequently appointed and had entered upon the work before the end of the year. The plan when carried out will provide an ample supply of water of the same excellent quality furnished by Wachusett Reservoir in ample quantity for the needs of the district for many years. Provision is also made in the act for an additional water supply for the city of Worcester to be taken from the Quinepoxet River, one of the principal tributaries of Wachusett Reservoir, from which the water is to be diverted by pumping to the storage reservoirs of the city of Worcester.

THE SANITARY PROTECTION OF PUBLIC WATER SUPPLIES.

The great majority of the inhabitants of the State are supplied with surface waters taken from natural lakes or ponds or from artificial reservoirs constructed for the purpose. In a very few cases these watersheds contain small villages and most of them contain a number of farms, and for the protection of these watersheds rules and regulations have been established by this Department under the authority of legislative acts. Ever since the beginning of the introduction of municipal water supplies 50 years or more ago the population of rural districts has been gradually decreasing and comparatively little difficulty has been encountered in protecting adequately the purity of public supplies. Furthermore, the acts under which water supplies have been introduced have nearly always contained authority for the municipality controlling the works to acquire lands about its sources of supply to protect them from occupation or from uses unfavorable to the purity of the supply. Provision is also made in the general laws whereby cities, towns and fire districts are authorized to take lands by eminent domain for the protection of their water supplies, subject to the approval of this Department. Under these laws many cities and towns have acquired such lands within their watersheds as were necessary to prevent their unfavorable occupation, but in the comparatively few cases where adequate protection has not been secured difficulties are arising in the proper protection of the sources of supply. The introduction of motor transportation, furthermore, has made possible the occupation of lands formerly too remote from centers of population and industry to permit of their use for occupation, and under these conditions the watersheds of water supplies near the large centers of population, and especially the neighborhood of the Metropolitan District, have rapidly become more populous in recent years. In consequence of the impracticability of adequately protecting their watersheds from a growing population, a serious question has arisen in a number of cities and towns as to the practicability of continuing the use of existing sources of supply, and in some of them filtration has already been resorted to or is under consideration. The use of water more or less directly polluted by sewage and other wastes of human life and industry is undesirable, no matter how effectively it may be treated for the purpose of neutralizing the effects of pollution. It is fortunate that so many of the public water supplies of the State have been protected by the foresight of the managers of these works who have secured such adequate control of their watersheds that they can continue to be used with safety for an indefinite time. The continuation of this wise policy will no doubt secure such further protection as is the case of most of the sources of supply in use.

Rules and regulations for the sanitary protection of the public water supplies have been established by this Department for the protection of the water supplies of 70 cities and towns in previous years, and similar rules were enacted during the past year for the Tatnuck Brook watershed of the city of Worcester and for the Lakeville State Sanatorium and the Norfolk State Hospital.

The cities, towns and districts for which rules and regulations had been established up to the end of the year are the following:

Abington and Rockland	Danvers and Middleton	Lee
Adams	Easthampton	Leicester (Cherry Valley and Rochdale)
Amherst	Fall River	Leominster
Andover	Falmouth	Lincoln and Concord
Ashburnham	Fitchburg	Lynn
Ashfield	Gardner	Marlborough
Attleboro	Great Barrington	Maynard
Braintree	(Housatonic)	Medfield (State Hospital)
Brockton and Whitman	Greenfield	Metropolitan Water District
Cambridge	Haverhill	Milford
Chester	Hingham and Hull	Montague
Chicopee	Holden	Newburyport
Cohasset	Holyoke	Norfolk (State Hospital)
Concord	Hudson	
Dalton	Lakeville (State Sanatorium)	

Northampton	Rockport	Taunton
North Andover	Russell	Wakefield
Northborough	Rutland	Westfield
Norwood	Salem and Beverly	West Springfield
Peabody	Springfield	Weymouth
Pittsfield	Springfield and	Williamsburg
Plymouth	Ludlow	Winchester
Randolph and Holbrook	Stockbridge	Worcester

EXAMINATION OF PUBLIC WATER SUPPLIES.

The usual chemical and microscopical examinations of the waters of public water supplies have been made during the year, and many of the sources have been inspected by the engineers of the Division. Bacterial analyses have been made of many of the sources of supply, including those of the Metropolitan District. The average yearly results of chemical analyses of water from the public sources of supply examined during the year 1926 are given in the following table.

*Analyses of the Water of Public Water Supplies.**Averages of Chemical Analyses of Surface-Water Sources for the Year 1926.*

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus-pended.		
Metropolitan Water District	Wachusett Reservoir, upper end	.25	4.22	.0037	.0153	.0032	.29	1.2
	Wachusett Reservoir, lower end	.09	3.84	.0021	.0114	.0025	.28	1.3
	Sudbury Reservoir	.12	4.09	.0025	.0125	.0017	.31	1.4
	Framingham Reservoir No. 3	.11	4.38	.0025	.0136	.0026	.32	1.4
	Hopkinton Reservoir	.38	4.38	.0023	.0147	.0017	.37	1.3
	Ashland Reservoir	.43	4.64	.0037	.0163	.0022	.36	1.3
	Framingham Reservoir No. 2	.57	6.46	.0073	.0196	.0043	.76	1.7
	Lake Cochituate	.12	7.47	.0032	.0177	.0035	.79	2.8
	Chestnut Hill Reservoir	.12	4.11	.0021	.0121	.0022	.33	1.6
	Weston Reservoir	.10	3.89	.0027	.0114	.0014	.32	1.5
	Spot Pond	.06	4.02	.0030	.0144	.0028	.35	1.5
	Tap in State House	.11	4.21	.0015	.0120	.0026	.32	1.5
	Tap in Revere	.06	3.93	.0015	.0119	.0017	.34	1.6
	Tap in Quincy	.10	4.07	.0010	.0102	.0016	.33	1.6
	Big Sandy Pond	.04	3.89	.0056	.0137	.0021	.69	0.8
	Dry Brook	.15	7.66	.0010	.0100	.0026	.15	4.7
	Bassett Brook	.00	4.92	.0007	.0062	.0011	.13	3.0
	Amherst	Amethyst Brook large reservoir	.44	3.95	.0022	.0143	.0028	.16	1.0
Amethyst Brook small reservoir		.16	3.76	.0043	.0151	.0038	.18	1.1
Haggett's Pond	.11	4.65	.0021	.0145	.0020	.39	2.0	
Upper Naukeag Lake	.06	2.71	.0008	.0055	.0004	.15	0.8	
Bear Swamp Brook	.19	6.17	.0019	.0120	.0012	.16	3.1	
Phillipston Reservoir	.36	4.41	.0090	.0220	.0062	.16	1.1	
Buckman Brook Reservoir	.17	4.07	.0058	.0213	.0079	.16	0.8	
Thousand Acre Meadow Brook	1.20	5.89	.0066	.0226	.0033	.16	1.5	
Inlet of filter	.35	4.10	.0060	.0183	.0034	.14	1.1	
Outlet of filter	.33	4.17	.0036	.0166	.0032	.14	1.2	
Reservoir	.10	4.33	.0029	.0149	.0031	.21	1.5	
Freeland Brook	.00	4.40	.0007	.0033	.0002	.23	1.3	
Silver Lake	.06	3.77	.0039	.0129	.0025	.58	0.9	
Cooley Hill Reservoir	.02	4.70	.0008	.0129	.0015	.32	1.5	
Lower Hobbs Brook Reservoir	.12	5.64	.0050	.0194	.0029	.44	2.3	
Upper Hobbs Brook Reservoir	.42	6.06	.0057	.0217	.0049	.42	2.3	
Stony Brook Reservoir	.33	6.67	.0034	.0183	.0027	.53	2.5	
Fresh Pond	.06	8.90	.0062	.0186	.0037	.69	4.2	
Thunder Brook	.01	6.58	.0044	.0038	.0003	.11	4.4	
Kitchen Brook	.00	5.55	.0009	.0044	.0007	.09	3.1	
Austin Brook Reservoir	.17	3.92	.0027	.0110	.0011	.12	1.5	
Horn Pond	.13	4.15	.0043	.0197	.0057	.12	1.7	
Morton Brook	.06	5.08	.0031	.0056	.0014	.29	1.5	
Cooley Brook	.38	5.43	.0057	.0122	.0025	.21	1.6	
Tap in town	.13	3.94	.0014	.0111	.0025	.23	1.4	
McClellan Reservoir	.01	7.85	.0010	.0067	.0006	.13	4.5	
Mountain Brook Reservoir	.04	9.17	.0006	.0050	.0007	.13	6.6	
Nagog Pond	.05	3.50	.0026	.0092	.0018	.38	1.1	
Egypt Brook Reservoir	.16	4.02	.0017	.0089	.0010	.11	1.3	
Windsor Reservoir	.33	5.95	.0027	.0177	.0040	.11	2.6	
Cady Brook	.21	5.21	.0022	.0111	.0020	.11	2.8	

Averages of Chemical Analyses of Surface-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus- pended.		
Danvers	Middleton Pond	.33	4.94	.0042	.0184	.0020	.40	1.6
	Swan Pond	.17	5.32	.0060	.0203	.0038	.37	2.0
Deerfield (South Deer- field Water Supply District)	Roaring Brook	.07	7.10	.0009	.0062	.0007	.18	3.6
Egremont (South)	Goodale Brook	.01	5.05	.0005	.0038	.0014	.10	3.3
FALL RIVER	North Watuppa Lake	.06	4.17	.0036	.0124	.0024	.50	1.2
Falmouth	Long Pond	.01	4.10	.0015	.0081	.0012	1.07	0.5
FITCHBURG	Meetinghouse Pond	.06	3.08	.0035	.0142	.0024	.18	1.1
	Scott Reservoir	.14	3.72	.0099	.0161	.0035	.19	0.8
	Wachusett Lake	.07	3.08	.0035	.0136	.0022	.19	0.9
	Falulah Brook	.13	3.97	.0045	.0139	.0031	.20	0.9
	Ashby Reservoir	.24	3.53	.0060	.0154	.0029	.17	0.8
GARDNER	Crystal Lake	.06	4.80	.0027	.0126	.0017	.30	2.0
GLOUCESTER	Dike's Brook Reservoir	.32	4.41	.0047	.0106	.0011	.81	0.8
	Wallace Reservoir	.33	4.51	.0025	.0155	.0024	.89	0.7
	Haskell Brook Reservoir	.10	4.20	.0012	.0090	.0022	.78	0.7
Great Barrington (Fire District)	East Mountain Reservoir	.08	5.96	.0024	.0097	.0013	.13	3.8
Great Barrington (Housatonic)	Long Pond	.02	7.87	.0037	.0206	.0053	.15	6.2
Greenfield	Glen Brook Upper Reservoir	.02	5.97	.0029	.0083	.0005	.15	3.3
	Glen Brook Lower Reservoir	.02	5.45	.0029	.0109	.0020	.15	3.5
Hadley (Water Supply District)	Hart's Brook Reservoir	.09	4.60	.0009	.0082	.0017	.19	2.1
Hatfield	Running Gutter Brook Reservoir	.21	8.22	.0043	.0081	.0027	.25	2.9
HAVERHILL	Johnson's Pond	.13	5.26	.0034	.0155	.0023	.41	2.3
	Crystal Lake	.12	4.00	.0015	.0148	.0020	.34	1.5
	Kenoza Lake	.11	5.26	.0037	.0221	.0072	.39	2.1
	Lake Saltonstall	.07	6.68	.0057	.0211	.0054	.60	3.1
	Pentucket Lake	.10	5.19	.0029	.0189	.0066	.41	2.2
	Millvale Reservoir	.36	5.84	.0034	.0157	.0028	.38	2.2
Hingham	Accord Pond	.12	4.18	.0031	.0113	.0014	.61	1.1
	Fulling Mill Pond	.27	5.65	.0079	.0203	.0058	.70	1.9
Hinsdale (Fire District)	Reservoir	.09	3.08	.0013	.0085	.0016	.11	0.7
HOLYOKE	Whiting Street Reservoir	.08	5.90	.0079	.0157	.0037	.26	3.3
	Fomer Reservoir	.27	4.13	.0062	.0186	.0053	.16	1.2
	Wright and Ashley Pond	.08	5.37	.0039	.0172	.0035	.18	2.6
	High Service Reservoir	.07	4.50	.0040	.0148	.0034	.18	1.8
	White Reservoir	.15	3.90	.0052	.0155	.0032	.14	1.6
	Gates Pond	.03	4.32	.0048	.0133	.0018	.26	1.4
Hudson	Cold Brook Reservoir	.10	3.75	.0004	.0049	.0006	.13	1.2
Huntington (Fire Dis- trict)	Dow's Brook Reservoir	.28	6.23	.0038	.0160	.0027	.66	2.2
Ipswich	Merrimack River, filtered	.36	6.24	.0059	.0085	-	.63	1.5
LAWRENCE	Codding Brook Upper Reservoir	.11	4.85	.0014	.0083	.0010	.14	2.2
Lee	Codding Brook Lower Reservoir	.11	4.51	.0028	.0089	.0009	.15	2.2
	Basin Pond Brook	.50	4.50	.0034	.0161	.0020	.15	1.4
Lenox	Reservoir	.02	8.05	.0007	.0069	.0006	.11	6.0
	Laurel Lake	.07	16.74	.0043	.0210	.0048	.23	18.2
LEOMINSTER	Morse Reservoir	.12	3.19	.0036	.0137	.0022	.18	0.5
	Haynes Reservoir	.14	3.13	.0076	.0249	.0066	.21	0.6
	Fall Brook Reservoir	.08	2.98	.0029	.0112	.0021	.21	0.8
	Sandy Pond	.02	3.73	.0015	.0099	.0014	.30	1.5
Lincoln	Cooley Brook	.08	5.92	.0050	.0101	.0026	.28	3.0
Longmeadow	Birch Reservoir	.07	5.30	.0115	.0160	.0030	.69	1.9
LYNN	Breed's Reservoir	.31	6.42	.0081	.0191	.0036	.67	2.4
	Walden Reservoir	.47	7.12	.0080	.0213	.0044	.69	2.7
	Hawkes Reservoir	.50	7.47	.0089	.0259	.0041	.77	3.0
Manchester	Gravel Pond	.08	4.40	.0014	.0119	.0016	.78	1.2
MARLBOROUGH	Lake Williams	.09	5.68	.0031	.0219	.0044	.63	2.2
	Millham Brook Reservoir	.40	5.67	.0058	.0202	.0038	.42	1.7
	White Pond	.08	3.50	.0013	.0093	.0013	.26	0.9
Maynard	Charles River, filtered	.27	5.67	.0016	.0090	-	.35	1.9
Milford	Lake Pleasant	.01	3.78	.0012	.0068	.0010	.18	0.9
Montague	Wannacomet Pond	.11	8.08	.0043	.0169	.0078	2.46	1.9
Nantucket	Little Quittacas Pond	.23	4.30	.0033	.0165	.0030	.52	1.2
NEW BEDFORD	Great Quittacas Pond	.32	4.45	.0023	.0161	.0031	.52	1.1
	Artichoke River	.32	7.37	.0284	.0421	.0120	.54	2.5
NEWBURYPORT	Notch Brook Reservoir	.03	8.19	.0020	.0052	.0011	.10	6.5
NORTH ADAMS	Broad Brook	.09	4.81	.0027	.0077	.0016	.10	2.4
	Mount Williams Reservoir	.02	7.40	.0024	.0076	.0010	.10	5.6
NORTHAMPTON	Middle Reservoir	.25	4.42	.0030	.0114	.0013	.16	1.8
	Mountain Street Reservoir	.05	4.11	.0018	.0083	.0013	.18	2.0
North Andover	Great Pond	.09	5.46	.0030	.0163	.0023	.43	2.0
Northborough	Lower Reservoir	.52	5.25	.0038	.0229	.0062	.25	1.2
	Upper Reservoir	.52	5.14	.0051	.0238	.0074	.23	1.2

Averages of Chemical Analyses of Surface-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus- pended.		
North Brookfield . . .	Doane Pond . . . . .	.43	4.42	.0125	.0284	.0066	.22	1.1
	North Pond . . . . .	.46	4.56	.0096	.0299	.0080	.23	1.0
Northfield	Reservoir . . . . .	.43	5.03	.0018	.0096	.0015	.19	1.6
Norwood	Buckmaster Pond . . . . .	.11	5.05	.0046	.0195	.0064	.45	1.7
Orange	Reservoir . . . . .	.08	4.17	.0013	.0051	.0004	.15	0.9
Palmer (Fire District No. 1)	Lower Reservoir . . . . .	.16	4.87	.0049	.0131	.0029	.21	1.1
PEABODY	Spring Pond . . . . .	.25	7.15	.0106	.0181	.0030	.74	2.5
	Suntaug Lake . . . . .	.33	6.70	.0120	.0213	.0035	.84	2.4
PITTSFIELD	Ashley Lake . . . . .	.13	5.61	.0022	.0111	.0018	.17	3.8
	Ashley Brook . . . . .	.16	5.87	.0017	.0097	.0013	.15	4.4
	Hathaway Brook . . . . .	.12	7.88	.0045	.0117	.0061	.15	5.7
	Mill Brook . . . . .	.42	4.99	.0032	.0176	.0026	.14	2.1
	Sacket Brook . . . . .	.11	8.18	.0012	.0080	.0022	.14	6.6
	Farnham Reservoir . . . . .	.62	4.72	.0034	.0230	.0036	.11	1.7
Plymouth	Little South Pond . . . . .	.00	3.10	.0015	.0182	.0068	.62	0.4
	Great South Pond . . . . .	.01	3.17	.0017	.0154	.0035	.64	0.4
Randolph	Great Pond . . . . .	.29	5.74	.0034	.0175	.0021	.74	1.5
Rockport	Cape Pond . . . . .	.19	9.05	.0022	.0171	.0038	2.99	2.0
Russell	Black Brook . . . . .	.16	4.85	.0017	.0089	.0002	.16	1.7
Rutland	Muschopauge Lake . . . . .	.05	3.97	.0012	.0099	.0019	.40	1.5
SALEM	Wenham Lake . . . . .	.30	7.31	.0073	.0208	.0044	.88	2.7
	Longham Reservoir . . . . .	.84	7.43	.0125	.0290	.0040	.93	2.0
	Ipswich River at pumping station . . . . .	.64	11.86	.0223	.0252	.0049	.82	5.4
Shelburne (Shelburne Falls Fire District)	Fox Brook . . . . .	.21	6.07	.0022	.0123	.0029	.11	3.6
Southbridge	Hatchet Brook Reservoir No. 3 . . . . .	.10	3.52	.0025	.0123	.0027	.20	1.1
	Hatchet Brook Reservoir No. 4 . . . . .	.17	3.15	.0035	.0130	.0021	.18	0.9
South Hadley (Fire District No. 1)	Leaping Well Reservoir . . . . .	.04	3.15	.0031	.0107	.0018	.18	1.0
	Buttery Brook Reservoir . . . . .	.12	4.65	.0061	.0112	.0021	.32	1.4
Spencer	Shaw Pond . . . . .	.05	3.32	.0033	.0167	.0044	.21	1.3
SPRINGFIELD	Westfield Little River, filtered . . . . .	.13	4.20	.0010	.0071	—	.14	1.3
Stockbridge	Lake Averie . . . . .	.10	7.06	.0019	.0143	.0020	.13	5.6
Stoughton	Muddy Pond Brook . . . . .	.18	5.37	.0025	.0127	.0028	.37	1.2
TAUNTON	Assawompsett Pond . . . . .	.19	3.97	.0049	.0163	.0036	.50	0.8
	Elder's Pond . . . . .	.08	3.88	.0043	.0135	.0026	.51	0.9
Wakefield	Crystal Lake . . . . .	.13	7.09	.0060	.0176	.0039	.87	2.8
Wareham (Onset)	Jonathan Pond . . . . .	.02	3.11	.0028	.0096	.0017	.67	0.5
Wayland	Snake Brook Reservoir . . . . .	.71	5.55	.0047	.0229	.0017	.36	2.0
WESTFIELD	Montgomery Reservoir . . . . .	.44	3.45	.0034	.0186	.0048	.13	0.7
	Tillotson Brook Reservoir . . . . .	.11	3.43	.0031	.0073	.0017	.17	0.9
West Springfield	Bear Hole Brook . . . . .	.10	7.55	.0053	.0090	.0018	.20	4.4
	Bear Hole Brook, filtered . . . . .	.01	7.37	.0008	.0025	—	.19	4.5
West Stockbridge	East Mountain Reservoir . . . . .	.01	6.55	.0002	.0031	.0003	.18	3.0
Weymouth	Great Pond . . . . .	.35	4.64	.0021	.0138	.0026	.49	1.2
Williamsburg	Reservoir . . . . .	.09	4.92	.0003	.0064	.0005	.14	2.0
Williamstown	Rattlesnake Brook . . . . .	.00	8.52	.0009	.0053	.0010	.08	6.9
	Paul Brook . . . . .	.00	5.62	.0015	.0076	.0013	.10	3.9
Winchester	North Reservoir . . . . .	.02	4.72	.0020	.0148	.0034	.41	1.9
	South Reservoir . . . . .	.05	4.26	.0041	.0118	.0017	.37	1.7
	Middle Reservoir . . . . .	.10	4.25	.0048	.0229	.0063	.38	1.7
WORCESTER	Bottomly Reservoir . . . . .	.49	6.42	.0033	.0195	.0042	.34	2.2
	Kent Reservoir . . . . .	.12	4.30	.0031	.0143	.0023	.23	1.5
	Leicester Reservoir . . . . .	.20	4.01	.0037	.0153	.0029	.24	1.4
	Mann Reservoir . . . . .	.12	4.25	.0039	.0170	.0037	.23	1.5
	Upper Holden Reservoir . . . . .	.20	3.78	.0049	.0167	.0044	.21	1.2
	Lower Holden Reservoir . . . . .	.07	3.72	.0025	.0120	.0022	.22	1.2
	Kendall Reservoir . . . . .	.07	4.35	.0039	.0145	.0025	.20	1.3
	Pine Hill Reservoir . . . . .	.54	5.41	.0259	.0245	.0054	.27	1.6

Averages of Chemical Analyses of Ground-Water Sources for the Year 1926.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Acton (West and South Water Supply District)	Tubular wells	.00	8.95	.0006	.0020	.40	.0860	.0000	3.5	.004
Adams (Fire District)	Tubular wells	.00	14.20	.0000	.0007	.14	.0255	.0000	12.3	.004
Amesbury	Tubular wells	.15	17.32	.0074	.0044	.50	.0050	.0000	8.6	.447
Ashland	Tubular wells, old supply	.00	5.85	.0010	.0019	.54	.0030	.0000	2.1	.009
	Tubular wells, new supply	.03	6.20	.0011	.0034	.51	.0048	.0000	2.5	.022
ATTLEBORO	Wells	.00	5.98	.0010	.0044	.43	.0155	.0001	2.2	.008
Auburn	Tubular wells	.00	8.24	.0004	.0012	.53	.1780	.0001	3.6	.006
Avon	Wells	.00	7.13	.0006	.0017	.67	.1647	.0000	2.7	.004
Ayer	Large well	.00	7.73	.0015	.0029	.54	.0663	.0000	3.3	.018
	Tubular wells	.00	7.00	.0017	.0015	.34	.0067	.0000	3.3	.012
Barnstable	Tubular wells	.00	5.03	.0021	.0020	1.11	.0027	.0000	1.2	.011
Bedford	Large well	.00	4.62	.0005	.0019	.35	.0065	.0000	1.7	.007
Billerica	Wells	.13	10.77	.0007	.0050	.46	.0071	.0000	4.9	.032
Braintree	Filter-gallery	.00	16.52	.0013	.0059	1.84	.5133	.0001	5.9	.007
Bridgewater	Wells	.00	6.22	.0019	.0028	.70	.0485	.0000	1.9	.008
Brookline	Tubular wells and filter-gallery, filtered	.04	9.59	.0006	.0060	.76	.0207	.0000	4.3	.005
Canton	Springdale well	.05	6.00	.0012	.0051	.46	.0290	.0000	2.1	.007
	Well near Henry's Spring	.10	6.60	.0009	.0053	.49	.0480	.0000	2.2	.005
Chelmsford (North Chelmsford Fire District)	Tubular wells	.09	5.63	.0147	.0079	.48	.0653	.0002	2.2	.017
Chelmsford (Water District)	Tubular wells	.00	8.85	.0004	.0020	.56	.0880	.0013	3.1	.017
Cohasset	Tubular wells	.09	13.50	.0011	.0068	1.83	.1708	.0000	5.3	.014
	Dug well, filtered	.20	6.96	.0053	.0085	1.04	.0076	.0001	2.3	.017
Cummington	Tubular wells	.00	6.77	.0024	.0040	.13	.0030	.0000	3.8	.011
Dedham	Large well and tubular wells	.02	10.50	.0024	.0057	1.02	.1367	.0001	4.8	.008
Deerfield (Fire District)	Wells	.03	4.30	.0006	.0020	.16	.0028	.0000	1.9	.010
Douglas	Tubular wells	.00	6.05	.0011	.0019	.40	.0655	.0000	2.0	.007
Dracut (Water Supply District)	Tubular wells	.01	13.42	.0012	.0021	.73	.1858	.0001	6.0	.024
Dracut (Collinsville)	Tubular wells	.19	7.00	.0008	.0075	.43	.0202	.0000	2.4	.031
Dudley	Tubular wells	.00	4.40	.0003	.0022	.26	.0053	.0000	1.5	.005
Dunstable	Well	.00	5.00	.0005	.0028	.20	.0020	.0000	2.0	.005
Duxbury (Fire and Water District)	Tubular wells	.00	4.37	.0003	.0017	.81	.0077	.0000	0.9	.005
East Brookfield	Tubular wells	.00	4.17	.0011	.0023	.25	.0050	.0000	1.4	.008
Easthampton	Tubular wells	.00	7.60	.0005	.0016	.17	.0233	.0000	3.8	.006
Easton (North Easton Village District)	Well	.00	6.10	.0007	.0024	.53	.0601	.0001	2.2	.010
Edgartown	Large well	.00	3.77	.0003	.0017	.94	.0030	.0000	0.5	.009
Fairhaven	Old wells	.37	8.28	.0020	.0106	1.06	.0586	.0000	3.1	.014
	New wells	.00	7.50	.0000	.0016	1.13	.1200	.0001	2.2	.007
Foxborough (Water Supply District)	Tubular wells	.00	6.33	.0005	.0016	.49	.0423	.0000	1.8	.007
Frammingham	Filter-gallery	.01	20.77	.0010	.0028	1.44	.1072	.0000	9.1	.012
Franklin	Tubular wells	.00	6.10	.0005	.0023	.60	.0317	.0001	2.2	.008
Grafton	Filter-gallery	.04	12.93	.0009	.0045	1.52	.2333	.0000	4.7	.007
Granville	Well	.00	4.87	.0004	.0019	.14	.0017	.0000	1.0	.004
Great Barrington	Well near Green River	.01	8.25	.0016	.0047	.11	—	—	7.2	.005
	Filter-gallery near Green River	.00	8.07	.0003	.0036	.13	—	—	6.5	.007
Greenfield	Well near Green River	.00	7.50	.0006	.0020	.09	.0030	.0000	4.7	.007
Groton	Large well	.00	8.23	.0014	.0034	.23	.0037	.0000	3.9	.005
Groton (West Groton Water Supply District)	Tubular wells	.05	6.27	.0010	.0015	.23	.0095	.0000	3.5	.044
Hingham	Wells	.13	6.91	.0017	.0058	.70	.0148	.0000	2.2	.009
Holliston	Large well	.43	5.63	.0032	.0164	.34	.0041	.0000	1.7	.036
Hopkinton	Tubular wells	.00	10.77	.0003	.0017	.62	.1510	.0001	3.9	.008
Kingston	Tubular wells	.00	6.07	.0003	.0009	.68	.0045	.0000	1.4	.005
Leicester (Water Supply District)	Wells	.04	7.55	.0007	.0034	.26	.0382	.0000	2.8	.013
Leicester (Cherry Valley and Rochdale Water District)	Wells	.24	5.62	.0044	.0144	.37	.0027	.0000	2.1	.013

Averages of Chemical Analyses of Ground-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Littleton	Tubular wells	.00	4.07	.0004	.0023	.25	.0160	.0000	1.7	.011
LOWELL	Boulevard wells (tubular)	.55	7.55	.0357	.0061	.49	.0252	.0002	2.6	.301
	Boulevard wells, filtered	.04	6.60	.0004	.0030	.49	.0338	.0000	2.4	.015
Manchester . . .	Wells . . . .	.01	11.66	.0007	.0015	1.73	.1370	.0000	4.2	.018
Mansfield (Water Supply District)	Large well . . .	.00	4.52	.0006	.0015	.31	.0282	.0000	1.4	.008
Marblehead . . .	Inlet of filter .	.15	18.39	.0072	.0054	1.80	.0072	.0001	8.6	.131
	Outlet of filter .	.02	20.51	.0012	.0053	2.04	.0074	.0000	11.1	.007
	Well . . . .	.04	22.34	.0008	.0051	2.64	.0095	.0000	11.5	.011
Marion	Tubular wells .	.00	5.70	.0005	.0025	.70	.0307	.0000	1.5	.005
Marshfield . . .	Tubular wells at Humarock Beach	.00	7.85	.0004	.0017	2.06	.0360	.0000	2.6	.010
	New wells at Brant Rock . . . .	.00	7.80	.0001	.0014	2.05	.0265	.0000	1.5	.005
Mattapoisett . .	Tubular wells .	.00	6.95	.0009	.0020	1.06	.0572	.0001	2.8	.013
Medfield	Spring . . . .	.02	4.77	.0022	.0063	.32	.0057	.0000	1.5	.009
Medway	Wells . . . .	.00	8.07	.0020	.0027	.75	.0433	.0001	2.9	.010
Merimac	Tubular wells .	.00	9.30	.0004	.0017	.50	.0290	.0000	3.5	.011
Methuen	Tubular wells at Harris Brook	.30	7.97	.0046	.0096	.48	.0222	.0000	3.1	.041
	Tubular wells at Pine Island .	.01	10.96	.0005	.0035	.66	.0850	.0002	6.9	.021
Middleborough (Fire District)	Well . . . .	.16	7.78	.0116	.0065	.63	.0353	.0000	2.5	.426
	Filtered water .	.04	6.08	.0005	.0029	.63	.0352	.0000	2.2	.020
Millbury	Well . . . .	.00	5.95	.0006	.0030	.37	.0320	.0000	2.5	.006
Millis	Spring . . . .	.00	12.66	.0007	.0015	.88	.2700	.0000	5.7	.006
Monson	Large well . . .	.05	4.57	.0006	.0040	.19	.0052	.0000	1.2	.006
Monterey	Springs . . . .	.00	10.40	.0004	.0027	.13	.0032	.0000	7.9	.005
Nantucket	Wells at Wyers Valley . . . .	.00	5.07	.0003	.0008	1.77	.0033	.0000	1.2	.010
Natick	Large well . . .	.00	10.52	.0005	.0022	.98	.0448	.0000	5.5	.006
Needham	Wells . . . .	.00	7.70	.0003	.0017	.71	.1343	.0000	3.1	.006
	Hicks Spring .	.00	10.45	.0005	.0018	.94	.4133	.0000	3.6	.007
NEWBURYPORT . .	Wells and Artichoke River, filtered	.10	6.71	.0014	.0112	.60	.0156	.0000	2.7	.019
NEWTON	Tubular wells and filter-gallery .	.11	7.46	.0015	.0069	.58	.0380	.0000	3.2	.020
North Attleborough	Wells . . . .	.01	7.42	.0015	.0039	.55	.0375	.0000	2.6	.012
Northbridge . . .	Tubular wells .	.03	4.26	.0006	.0019	.29	.0062	.0000	1.4	.006
Norton	Tubular wells .	.00	4.65	.0004	.0013	.34	.0035	.0000	1.5	.016
Norwood	Tubular wells .	.08	9.58	.0039	.0045	.62	.0513	.0001	4.0	.064
Oak Bluffs	Springs . . . .	.00	4.87	.0007	.0031	.98	.0063	.0002	0.9	.005
Oxford	Tubular wells .	.00	6.40	.0004	.0020	.34	.0373	.0001	2.1	.005
Palmer (Bondsville)	Tubular wells .	.00	7.80	.0003	.0019	.28	.0310	.0000	2.4	.008
Pepperell	Tubular wells .	.01	3.93	.0005	.0021	.17	.0033	.0000	1.5	.004
Provincetown . .	Tubular wells .	.04	30.50	.0001	.0009	12.83	.0040	.0000	6.3	.032
Reading	Filter-gallery .	.71	9.98	.0132	.0143	1.24	.0073	.0000	2.7	.211
	Filtered water .	.40	17.78	.0011	.0101	1.22	.0058	.0002	9.9	.040
Salisbury	Old well . . . .	.14	7.26	.0012	.0052	.55	.0025	.0000	3.0	.011
	New well . . . .	.12	10.05	.0008	.0019	.55	.0026	.0000	5.4	.043
Scituate	Tubular wells .	.00	14.72	.0008	.0024	2.57	.1960	.0000	5.4	.005
Sharon	Well . . . .	.00	17.02	.0005	.0021	2.84	.3800	.0000	7.9	.005
	Tubular wells .	.00	6.57	.0005	.0019	.57	.0512	.0000	2.3	.005
Sheffield	Spring . . . .	.00	4.53	.0007	.0022	.10	.0037	.0000	2.1	.005
Shirley (Shirley Village Water District)	Well . . . .	.00	5.00	.0010	.0016	.39	.1600	.0000	1.4	.006
Shrewsbury . . .	Tubular wells .	.02	6.05	.0014	.0046	.42	.0267	.0001	2.3	.004
South Hadley (Fire District No. 2)	Large well . . .	.00	4.48	.0002	.0014	.16	.0283	.0000	1.4	.004
Sunderland . . .	Springs . . . .	.00	8.00	.0003	.0018	.14	.0020	.0000	4.6	.011
Tisbury	Well . . . .	.00	4.75	.0001	.0010	.98	.0030	.0000	0.9	.005
Uxbridge	Tubular wells .	.00	6.00	.0009	.0023	.44	.0530	.0000	2.1	.020
Walpole	Tubular wells .	.00	5.80	.0005	.0023	.41	.0390	.0000	2.4	.006
WALTHAM	Old well . . . .	.12	10.08	.0049	.0028	.78	.0098	.0000	4.2	.093
	New well . . . .	.00	7.85	.0008	.0036	.56	.0188	.0000	3.4	.006
Ware	Wells . . . .	.00	7.38	.0008	.0025	.49	.1381	.0000	2.9	.006
	Large well . . .	.00	7.44	.0007	.0022	.45	.1259	.0000	2.7	.005
Wareham (Fire District)	Tubular wells .	.00	4.77	.0004	.0017	.58	.0020	.0000	1.1	.004
Warren	Tubular wells .	.00	4.02	.0001	.0014	.23	.0205	.0000	1.3	.005
Webster	Wells . . . .	.00	5.65	.0021	.0030	.34	.0105	.0000	2.0	.006
Wellesley	Tubular wells .	.00	10.77	.0012	.0028	1.07	.0563	.0000	4.8	.003
	Well at Williams Spring . . . .	.01	13.97	.0009	.0053	1.96	.1187	.0000	5.4	.005
	Filter-gallery .	.00	11.18	.0009	.0030	1.20	.0812	.0000	4.8	.006

Averages of Chemical Analyses of Ground-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS—		Hardness.	Iron.
				Free.	Albu- minoid.		Nitrates.	Nitrites.		
Westborough . . .	Filter basin . . .	.01	3.85	.0021	.0095	.28	-	-	1.2	.007
West Brookfield . .	Tubular wells . .	.00	3.77	.0006	.0016	.26	.0063	.0000	1.5	.005
Westford . . .	Tubular wells . .	.02	5.70	.0009	.0026	.21	.0065	.0001	2.3	.014
Weston . . .	Well at Warren Ave. Tubular wells at Kendal Green . .	.22	7.85	.0009	.0077	.58	.0207	.0000	3.8	.011
West Stockbridge . .	Johnson's Spring .	.00	8.05	.0000	.0012	.64	.0765	.0000	3.4	.006
Williamstown . . .	Cold Spring . . .	.00	12.30	.0005	.0015	.12	.0015	.0000	8.7	.014
Winchendon . . .	Sherman Spring . .	.00	14.00	.0004	.0015	.08	.0313	.0000	14.1	.006
WOBBURN	Old wells . . .	.09	11.27	.0008	.0034	.10	.0050	.0000	7.2	.005
Worthington (Fire Dis- trict) . . .	New wells . . .	.25	3.80	.0012	.0056	.15	.0044	.0000	1.3	.018
Wrentham . . .	Filter-gallery . . .	.00	3.54	.0008	.0066	.14	.0042	.0000	1.2	.005
	Springs . . .	.01	12.12	.0018	.0035	1.15	.0237	.0000	5.2	.007
	Tubular wells . . .	.00	5.48	.0027	.0035	.14	.0013	.0000	1.5	.027
		.00	5.07	.0003	.0015	.31	.0190	.0000	1.6	.004

CONSUMPTION OF WATER.

A summary of the records of consumption of water as shown by pumping records or meter measurements kept in the various cities and towns is given in the following table, including the estimated population of each city and town and the consumption of water per person. The estimated population is based on the increase which took place in the cities and towns included in the table in the years 1920 to 1925. The apparently excessive consumption of water in some of the cities and towns is due to the use of large quantities of water for manufacturing and in others to the fact that the town is a resort of large numbers of people in the summer season not included in the census.

Average Daily Consumption of Water in Various Cities and Towns in 1926.

CITY OR TOWN.	Estimated Population.	AVERAGE DAILY CONSUMPTION.		CITY OR TOWN.	Estimated Population.	AVERAGE DAILY CONSUMPTION.	
		Gallons.	Gallons per Inhabitant.			Gallons.	Gallons per Inhabitant.
Metropolitan Water District . . .	1,322,253	130,184,800	98	BEVERLY . . .	22,710	1,451,000	64
Arlington . . .	26,199	1,504,400	57	Billerica . . .	5,166	273,000	53
Belmont . . .	16,157	1,056,900	65	Braintree . . .	13,716	967,000	70
BOSTON . . .	785,932	91,275,700	116	Bridgewater . . .	9,674	305,000	31
CHELSEA . . .	48,060	3,474,400	72	BROCKTON . . .	65,343	3,426,000	52
EVERETT . . .	42,463	5,215,900	123	Brookline . . .	43,668	4,207,000	96
Lexington . . .	8,072	517,000	64	CAMBRIDGE . . .	121,664	12,309,000	101
MALDEN . . .	52,326	3,139,800	60	Canton . . .	5,896	433,000	73
MEDFORD . . .	49,345	2,522,400	51	Chelmsford . . .	6,751	181,000	27
MELROSE . . .	20,557	1,379,600	67	CHICOPEE . . .	43,016	2,675,000	62
Milton . . .	13,557	701,600	52	Clinton . . .	14,420	874,000	61
Nahant . . .	1,692	178,200	105	Cohasset . . .	2,968	329,000	111
QUINCY . . .	62,491	4,757,000	76	Concord . . .	7,175	595,000	83
REVERE . . .	34,149	2,263,800	66	Danvers and Middle- ton . . .	13,697	1,470,000	107
SOMERVILLE . . .	100,220	7,791,000	78	Dartmouth . . .	9,533	123,000	13
Stoneham . . .	9,326	560,000	60	Dedham . . .	14,543	832,000	57
Swampscott . . .	9,123	720,800	79	Dracut . . .	6,624	128,000	19
Watertown . . .	26,285	2,059,300	78	Dudley . . .	4,773	194,000	41
Winthrop . . .	16,299	1,067,000	65	Duxbury . . .	1,715	142,000	83
Abington and Rock- land . . .	13,951	573,000	41	East Brookfield . .	939	41,000	44
Acton . . .	2,432	117,000	48	Easthampton . . .	11,652	814,000	70
Acushnet . . .	4,347	66,000	15	East Longmeadow .	3,290	56,000	17
Adams . . .	13,637	1,333,000	98	Easton . . .	5,391	216,000	40
Agawam . . .	6,543	115,000	18	Edgartown . . .	1,244	121,000	97
Amesbury . . .	11,468	731,000	64	Fairhaven . . .	11,534	417,000	36
Andover . . .	10,696	913,000	85	FALL RIVER . . .	130,695	6,501,000	50
Ashburnham . . .	2,188	126,000	57	Falmouth . . .	4,933	583,000	118
Athol . . .	9,602	780,000	81	FITCHBURG . . .	44,125	4,532,000	103
ATTLEBORO . . .	20,801	1,141,000	55	Foxborough . . .	5,094	476,000	93
Avon . . .	2,397	109,000	45	Frammingham . . .	21,887	1,382,000	63
Ayer . . .	3,032	227,000	75	Franklin . . .	7,167	499,000	70
Barnstable . . .	5,962	315,000	53	GARDNER . . .	19,082	869,000	46
Bedford . . .	1,544	61,000	40	GLOUCESTER . . .	25,461	1,788,000	76
				Grafton . . .	6,990	104,000	15

Average Daily Consumption of Water in Various Cities and Towns in 1926
— Concluded.

CITY OR TOWN.	Estimated Population.	AVERAGE DAILY CONSUMPTION.		CITY OR TOWN.	Estimated Population.	AVERAGE DAILY CONSUMPTION.	
		Gallons.	Gallons per Inhabitant.			Gallons.	Gallons per Inhabitant.
Greenfield	15,246	1,511,000	99	Oak Bluffs	1,367	171,000	125
Groton	2,477	230,000	93	Orange	5,141	190,000	37
Groveland	2,485	43,000	17	PEABODY	19,934	3,154,000	158
HAVERHILL	49,232	4,486,000	91	Pepperell	2,841	199,000	70
Holliston	2,833	117,000	41	PITTSFIELD	47,900	6,370,000	133
HOLYOKE	60,361	7,298,000	121	Plainville	1,541	99,000	64
Hudson	8,235	427,000	52	Plymouth	13,202	1,675,000	127
Ipswich	6,055	430,000	71	Provincetown	3,787	287,000	76
Kingston	2,528	246,000	97	Randolph and Holbrook	9,117	490,000	54
Lancaster	2,721	102,000	37	Reading	8,944	319,000	36
LAWRENCE	93,527	4,947,000	53	Rockport	3,963	283,000	71
Lincoln	1,359	246,000	181	SALEM	42,879	5,661,000	132
Littleton	1,438	49,000	34	Salisbury	1,844	249,000	135
Longmeadow	3,476	173,000	50	Saugus	13,117	700,000	53
LOWELL	110,296	5,785,000	52	Scituate	2,749	607,000	221
Ludlow	9,068	195,000	22	Sharon	3,249	306,000	94
LYNN	103,868	8,629,000	83	Shirley	2,421	55,000	23
Manchester	2,506	314,000	125	Shrewsbury	6,241	203,000	33
Mansfield	6,657	448,000	67	Southbridge	15,738	781,000	50
Marblehead	8,392	637,000	76	SPRINGFIELD	144,555	13,972,000	97
Marion	1,271	133,000	105	Stockbridge	1,843	219,000	119
MARLBOROUGH	16,478	620,000	38	Stoughton	8,055	538,000	67
Mattapoisett	1,612	97,000	60	TAUNTON	39,679	3,432,000	86
Maynard	8,011	360,000	45	Tisbury	1,462	216,000	148
Medfield	3,921	74,000	19	Uxbridge	6,330	571,000	90
Medway	3,182	166,000	52	Wakefield	16,128	775,000	48
Merrimac	2,384	140,000	59	Walpole	6,720	942,000	140
Methuen	21,689	1,151,000	53	WALTHAM	35,512	2,268,000	64
Middleborough	9,273	298,000	32	Ware	8,650	319,000	37
Milford and Hopedale	18,286	825,000	45	Wareham	5,830	201,000	34
Millbury	6,599	273,000	41	Warren	4,047	59,000	15
Millis	1,852	119,000	64	Webster	13,415	695,000	52
Montague and Erving	9,374	913,000	97	Wellesley	9,614	755,000	79
Nantucket	3,223	339,000	105	West Brookfield	1,321	44,000	33
Natick	13,264	668,000	50	WESTFIELD	19,490	2,020,000	104
Needham	9,370	608,000	65	Westford	3,651	148,000	40
NEW BEDFORD	119,539	8,940,000	75	Weston	3,031	220,000	73
NEWBURYPORT	15,664	1,379,000	88	West Springfield	15,703	1,601,000	103
NEWTON	54,393	4,258,000	78	Weymouth	17,692	1,052,000	59
North Andover	6,594	449,000	68	Whitman	7,999	283,000	35
North Attleborough	9,900	635,000	64	WOBRUN	18,729	1,929,000	103
Northbridge	10,051	672,000	67	WORCESTER	192,958	15,541,000	81
North Brookfield	3,133	310,000	99	Wrentham	3,295	102,000	31
Norton	2,848	150,000	53				
Norwood	14,456	1,353,000	94				

RAINFALL.

The average rainfall in the State for 1926 was 39.93 inches or 4.58 inches below the normal.

The following table shows the normal rainfall, the rainfall for the year 1926, and the excess or deficiency of precipitation in each month as compared with the normal.

MONTH.	Normal Rainfall (Inches).	Rainfall in 1926 (Inches).	Excess or Deficiency in 1926 (Inches).	MONTH.	Normal Rainfall (Inches).	Rainfall in 1926 (Inches).	Excess or Deficiency in 1926 (Inches).
January	3.79	2.76	-1.03	August	4.15	3.84	-0.31
February	3.64	4.95	+1.31	September	3.45	1.36	-2.09
March	3.95	2.98	-0.97	October	3.66	5.15	+1.49
April	3.68	2.41	-1.27	November	3.88	4.96	+1.08
May	3.58	2.34	-1.24	December	3.69	3.37	-0.32
June	3.29	2.17	-1.12				
July	3.75	3.64	-0.11	Totals	44.51	39.93	-4.58

FLOW OF STREAMS.

Sudbury River.

The average yield of the Sudbury River during the year 1926 was 746,000 gallons per day per square mile of drainage area. The yield was above the normal in the months of March, August and November, and less than normal during the remaining months.

The average yield for the six driest months, May to October, inclusive, was 167,000 gallons per square mile per day.

The following table shows the relation between the average daily yield of the Sudbury River for each month in the year 1926 and the normal yield of that stream during the past 52 years. The drainage area of the Sudbury River above the point of measurement is 75.2 square miles.

Table showing the Average Daily Yield of the Sudbury River for Each Month in the Year 1926, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1926.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.727	1.117	1.335	.863	-.392	-.254
February	2.402	1.553	1.533	.991	-.869	-.562
March	4.197	2.713	4.218	2.726	+ .021	+ .013
April	3.080	1.991	2.982	1.927	-.098	-.064
May	1.703	1.101	1.114	.720	-.589	-.381
June . . . . .	.777	.501	.161	.104	-.616	-.397
July . . . . .	.309	.200	-.106	-.068	-.415	-.268
August . . . . .	.333	.215	.360	.233	+ .027	+ .018
September . . . . .	.340	.220	-.175	-.113	-.515	-.333
October . . . . .	.575	.372	.176	.114	-.399	-.258
November	1.115	.720	1.242	.803	+ .127	+ .083
December	1.489	.963	1.037	.670	-.452	-.293
Average for whole year	1.499	.969	1.154	.746	-.345	-.223

The rainfall on the Sudbury River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1921 to 1926 inclusive, together with the average for a period of fifty-two years, are given in the following table:

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area.

MONTH.	1921.			1922.			1923.			1924.		
	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.
January	2.78	1.742	62.7	1.89	.577	30.5	7.64	2.779	36.4	3.60	3.205	89.1
February	4.10	1.361	33.2	2.35	1.316	40.5	2.31	1.507	65.3	2.56	1.193	46.7
March	2.72	4.050	148.8	5.35	4.587	85.7	3.25	5.659	173.9	2.66	3.462	130.0
April	5.30	1.973	37.2	1.63	3.371	207.1	5.35	4.197	78.4	5.49	5.268	96.1
May	3.23	2.957	91.6	5.39	3.126	58.0	1.01	2.099	207.3	3.22	2.495	77.6
June	3.82	.295	7.7	8.90	2.695	30.3	4.12	0.668	16.2	1.49	.485	32.5
July	6.86	1.822	26.6	3.21	1.287	40.1	2.94	0.118	4.0	3.19	-0.094	-2.9
August	1.20	.105	8.7	4.85	.627	12.9	2.17	-0.130	-6.0	4.73	0.207	4.4
September	1.88	-.099	-5.3	4.09	1.135	27.7	1.54	-0.099	-6.5	5.67	0.706	12.4
October	1.12	-.175	-15.6	2.28	.486	21.3	5.71	0.707	12.4	0.11	0.011	10.0
November	7.95	1.152	14.5	1.34	.639	47.8	5.83	1.969	33.8	2.51	0.286	11.4
December	2.54	1.367	53.8	3.42	.730	21.4	4.96	3.921	79.1	1.73	0.489	28.4
Totals and averages	43.50	16.550	38.0	45.60	20.576	45.1	46.83	23.395	50.0	36.96	17.713	47.9

MONTH.	1925.			1926.			MEAN FOR FIFTY-TWO YEARS, 1875-1926.		
	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.
January	4.47	.328	7.4	3.00	1.539	51.2	4.00	1.992	49.8
February	2.20	2.985	136.0	5.92	1.596	27.0	4.06	2.523	62.1
March	5.69	3.895	68.4	3.23	4.863	150.6	4.28	4.839	113.2
April	2.95	2.570	87.2	2.21	3.323	150.5	3.61	3.437	95.3
May	2.45	1.036	42.2	2.29	1.284	56.1	3.26	1.963	60.2
June	4.75	.374	7.9	1.60	.179	11.2	3.27	.867	26.6
July	5.35	.427	8.0	3.18	-.122	-3.8	3.70	.356	9.6
August	1.25	.102	8.2	5.51	.415	7.5	3.75	.384	10.2
September	3.19	.068	2.1	1.40	-.196	-14.0	3.36	.380	11.3
October	4.41	.626	14.2	3.77	.203	5.4	3.58	.663	18.5
November	3.17	1.001	31.6	5.27	1.386	26.3	3.81	1.243	32.6
December	5.76	3.330	57.8	4.03	1.195	29.7	3.79	1.717	45.4
Totals and averages	45.64	16.742	36.7	41.41	15.665	37.8	44.47	20.364	45.8

The following table gives the record of the yield of the Sudbury River watershed in gallons per day per square mile for each of the past six years and the mean for the past fifty-two years:

Yield of the Sudbury River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1921.	1922.	1923.	1924.	1925.	1926.	Mean for Fifty- two Years, 1875-1926.
January	976,000	323,000	1,558,000	1,796,000	184,000	863,000	1,117,000
February	845,000	817,000	935,000	715,000	1,852,000	991,000	1,553,000
March	2,270,000	2,571,000	3,172,000	1,941,000	2,183,000	2,726,000	2,713,000
April	1,144,000	1,956,000	2,435,000	3,056,000	1,491,000	1,927,000	1,991,000
May	1,658,000	1,753,000	1,177,000	1,399,000	581,000	720,000	1,101,000
June	171,000	1,561,000	387,000	281,000	217,000	104,000	501,000
July	1,021,000	722,000	67,000	-52,000	239,000	-68,000	200,000
August	59,000	351,000	-73,000	116,000	57,000	233,000	215,000
September	-58,000	657,000	-57,000	408,000	39,000	-113,000	220,000
October	-98,000	272,000	397,000	6,000	351,000	114,000	372,000
November	667,000	370,000	1,140,000	166,000	580,000	803,000	720,000
December	766,000	409,000	2,198,000	274,000	1,867,000	670,000	963,000
Average for whole year	788,000	980,000	1,114,000	841,000	797,000	746,000	969,000
Average for driest six months	294,000	463,000	307,000	152,000	247,000	167,000	370,000

¹ The drainage area of the Sudbury River used in making up these records included water surfaces amounting to about 2 per cent of the whole area from 1875 to 1878, inclusive, subsequently increasing by the construction of storage reservoirs to about 3 per cent in 1879, to 3.5 per cent in 1885, to 4 per cent in 1894, and to 6.5 per cent in 1898. The drainage area also contains extensive areas of swampy land, which, though covered with water at times, are not included in the above percentages of water surfaces.

Nashua River.

The average yield of the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton during the year 1926 was 826,000 gallons per day per square mile of drainage area, or about 23.6 per cent less than the average for the past 30 years.

The average yield for the six driest months was 389,000 gallons per square mile per day, or 27.3 per cent below the normal.

The following table shows the normal yield of the river by months for the past 30 years, the actual yield in the year 1926, and the excess or deficiency in each month. The drainage area of the Nashua River above the point of measurement was 119 square miles from 1897 to 1907 and 118.19 square miles from 1908 to 1913, inclusive. Since January 1, 1914, the city of Worcester has been diverting water from 9.35 square miles of this drainage area for the supply of that city, leaving the net drainage area 108.84 square miles.

Table showing the Average Daily Yield of the South Branch of the Nashua River for Each Month in the Year 1926, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1926.		EXCESS OR DEFICIENCY	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.795	1.160	1.471	.951	-.324	-.209
February	2.007	1.297	1.286	.831	-.721	-.466
March	4.058	2.623	2.920	1.887	-1.138	-.736
April	3.462	2.238	3.738	2.416	+.276	+.178
May	2.014	1.302	1.276	.825	-.738	-.477
June	1.241	.802	.627	.405	-.614	-.397
July	.726	.469	.400	.258	-.326	-.211
August	.600	.388	.390	.252	-.210	-.136
September	.539	.349	.311	.201	-.228	-.148
October	.692	.447	.599	.387	-.093	-.060
November	1.181	.763	1.355	.876	+.174	+.113
December	1.773	1.146	1.008	.651	-.765	-.495
Average for whole year	1.672	1.081	1.279	.826	-.393	-.255

The rainfall on the Nashua River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the

past six years, 1921 to 1926, inclusive, together with the average for the past 30 years, are given in the following table:

Rainfall, in Inches, received and collected on the Nashua River Drainage Area.

MONTH.	1921.			1922.			1923.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	2.67	2,521	94.3	2.40	1,058	44.0	7.95	3,146	39.6
February	4.07	1,719	42.2	3.77	1,624	43.0	2.30	1,617	70.5
March	2.87	4,477	156.1	6.21	5,960	96.0	3.29	5,478	166.3
April	6.51	3,329	51.1	2.19	4,108	187.6	5.52	5,244	95.0
May	3.01	3,695	123.0	4.78	3,511	73.5	1.44	2,339	162.1
June	3.75	.828	22.1	9.22	3,838	41.6	3.51	1,062	30.3
July	6.41	1,821	28.4	4.91	2,672	54.5	3.72	.529	14.2
August	1.94	.438	22.6	5.59	1,419	25.4	2.04	.264	12.9
September	2.35	.197	8.4	2.77	.891	32.2	1.04	.159	15.3
October	2.00	.282	14.1	2.41	.774	32.1	5.16	.766	14.9
November	7.31	1,366	18.7	1.59	.912	57.3	5.87	1,682	28.7
December	2.77	2,271	82.1	4.02	.987	24.5	5.07	3,062	60.4
Totals and averages	45.66	22,944	50.3	49.86	27,754	55.7	46.91	25,348	54.0

MONTH.	1924.			1925.			1926.			MEAN FOR THIRTY YEARS, 1897-1926.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	4.23	3,346	79.2	3.68	.563	15.3	2.64	1,695	64.1	3.66	2,070	56.6
February	3.31	1,332	40.3	2.27	2,524	111.3	5.77	1,340	23.2	3.83	2,105	55.0
March	2.41	3,028	125.6	5.81	4,005	69.0	2.92	3,366	115.1	4.06	4,679	115.3
April	6.58	7,262	110.4	3.06	2,482	81.1	2.46	4,165	169.4	3.88	3,863	99.4
May	3.55	3,519	99.0	2.14	1,262	58.8	2.00	1,471	73.6	3.30	2,323	70.3
June	1.13	.775	68.4	3.97	.684	17.2	2.05	.699	34.2	3.82	1,384	36.3
July	2.60	.234	9.0	3.95	.417	10.6	2.93	.461	15.7	4.09	.837	20.5
August	4.61	.449	9.7	2.04	.347	17.0	2.90	.449	15.5	3.91	.692	17.7
September	4.79	.552	11.5	4.26	.596	14.0	1.43	.347	24.2	3.63	.601	16.6
October	0.09	.114	122.5	4.37	.779	17.8	4.69	.691	14.7	3.20	.798	24.9
November	3.30	.476	14.4	3.43	1,378	40.2	5.32	1,512	28.4	3.67	1,317	35.9
December	2.03	.702	34.6	4.39	2,897	65.9	4.20	1,162	27.7	4.00	2,044	51.1
Totals and averages	38.63	21,789	56.4	43.37	17,934	41.3	39.31	17,358	44.2	45.05	22,713	50.4

The following table gives the record of the yield of the Nashua River watershed in gallons per day per square mile for each of the past six years and the mean for the past 30 years:

Yield of the Nashua River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1921.	1922.	1923.	1924.	1925.	1926.	Mean for Thirty Years, 1897-1926.
January	1,413,000	593,000	1,764,000	1,876,000	316,000	951,000	1,160,000
February	1,067,000	1,008,000	1,004,000	798,000	1,566,000	831,000	1,297,000
March	2,510,000	3,341,000	3,071,000	1,697,000	2,245,000	1,887,000	2,623,000
April	1,931,000	2,383,000	3,042,000	4,213,000	1,440,000	2,416,000	2,238,000
May	2,071,000	1,968,000	1,311,000	1,973,000	708,000	825,000	1,302,000
June	480,000	2,223,000	615,000	449,000	396,000	405,000	802,000
July	1,021,000	1,498,000	297,000	131,000	234,000	258,000	469,000
August	246,000	795,000	148,000	252,000	194,000	252,000	388,000
September	114,000	516,000	92,000	320,000	345,000	201,000	349,000
October	158,000	434,000	430,000	64,000	437,000	387,000	447,000
November	791,000	528,000	974,000	276,000	799,000	876,000	763,000
December	1,273,000	553,000	1,717,000	394,000	1,624,000	651,000	1,146,000
Average for whole year	1,092,000	1,321,000	1,207,000	1,035,000	854,000	826,000	1,081,000
Average for driest six months	468,000	723,000	424,000	239,000	386,000	389,000	535,000

¹ The drainage area used in making up these records included water surfaces amounting to 2.2 per cent of the whole area from 1897 to 1902, inclusive, to 2.4 per cent in 1903, to 3.6 per cent in 1904, to 4.1 per cent in 1905, to 5.1 per cent in 1906, to 6 per cent in 1907, to 7 per cent in 1908, 1909 and 1910, to 6.5 per cent in 1911, to 6.8 per cent in 1912, to 7 per cent in 1913, to 7.4 per cent in 1914 and 1915, to 7.6 per cent in 1916, to 7.4 per cent in 1917 and 1918, to 7.5 per cent in 1919, 1920, 1921 and 1922, to 7.4 per cent in 1923 and 1924, to 6.4 per cent in 1925, and 5.9 per cent in 1926.

Nashua and Sudbury Rivers.

The records of the flow of the Sudbury River are available beginning with 1875. The measurements of the flow of the South Branch of the Nashua were not begun until 1897. The following table shows a comparison of the average flow of these rivers during the period since the Nashua River measurements were begun and also the comparative flow of each stream in the year 1926.

Table showing Comparative Flow of the Nashua and Sudbury Rivers in 1926 and the Average Flow of those Streams in the 30 Years from 1897 to 1926, inclusive, in Gallons per Day per Square Mile.

	SUDBURY RIVER.			NASHUA RIVER.		
	Normal Flow, 1897-1926.	Actual Flow, 1926.	Excess or Deficiency.	Normal Flow, 1897-1926.	Actual Flow, 1926.	Excess or Deficiency.
January	1,051,000	863,000	-188,000	1,160,000	951,000	-209,000
February	1,311,000	991,000	-320,000	1,297,000	831,000	-466,000
March	2,597,000	2,726,000	+129,000	2,623,000	1,887,000	-736,000
April	1,965,000	1,927,000	- 38,000	2,238,000	2,416,000	+178,000
May	1,092,000	720,000	-372,000	1,302,000	825,000	-477,000
June	526,000	104,000	-422,000	802,000	405,000	-397,000
July	212,000	- 68,000	-280,000	469,000	258,000	-211,000
August	171,000	233,000	+ 62,000	388,000	252,000	-136,000
September	208,000	-113,000	-321,000	349,000	201,000	-148,000
October	243,000	114,000	-129,000	447,000	387,000	- 60,000
November	561,000	803,000	+242,000	763,000	876,000	+113,000
December	921,000	670,000	-251,000	1,146,000	651,000	-495,000
Average for whole year	902,000	746,000	-156,000	1,081,000	826,000	-255,000
Average for driest six months	278,000	167,000	-111,000	535,000	389,000	-146,000

Merrimack River.

The Merrimack River is the second in size of the streams of Massachusetts. The river rises in the White Mountains of New Hampshire and flows southerly through the central part of that State until it enters Massachusetts, where it turns to the east and flows in a general northeasterly direction the remainder of its course to the sea. The total length of its watershed from its extreme northerly limits in the mountains of northern New Hampshire to its extreme southerly limits in the hills of Hopkinton, Massachusetts, is about 137 miles and its extreme width about 66 miles. Its total drainage area above its mouth at Newburyport is about 5,000 square miles, of which about $\frac{1}{4}$ is within the limits of Massachusetts and the remainder within the State of New Hampshire.

Records of the flow of the Merrimack River have been kept continuously at Lawrence since 1880. The drainage area of the river at that point is 4,663 square miles, including 118.19 square miles tributary to the South Branch of the Nashua River used for the water supply of the Metropolitan District and in part for the city of Worcester, 75.2 square miles on the Sudbury River, and 18 square miles tributary to Lake Cochituate. The flow as measured at Lawrence includes the water wasted from these drainage areas. In the year 1926 all of the water from the southern Sudbury drainage area and nearly all of that from Lake Cochituate was wasted into the stream, but no water whatever was wasted from Wachusett Reservoir into the Nashua River except such as was discharged from the reservoir under the provisions of the Metropolitan water supply act. In presenting the record of the flow of the river these drainage areas have been deducted, leaving the net drainage area above Lawrence 4,567 square miles in 1880, 4,570 square miles in the years 1891 to 1897, inclusive, and 4,452 square miles since the latter year. The quantity of water overflowing from the Cochituate and Sudbury watersheds as measured by the Metropolitan District Commission has also been deducted from the flow of the river as measured at Lawrence. The average flow of the river during the year 1926 amounted to 1.205 cubic feet per second per square mile, or 779,000 gallons per day per square mile of drainage area, which is about 17.6 per cent below the normal for the past 47 years. The flow exceeded the normal only in April and November and was but slightly below the normal in May.

The following table shows the relation between the normal flow of this stream during the past 47 years and the actual flow during each month of the year 1926.

Table showing the Average Monthly Flow of the Merrimack River at Lawrence for the Year 1926, in Cubic Feet per Second per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	Normal Flow, 1880-1926.	Actual Flow in 1926.	Excess or Deficiency.
January	1.253	1.027	— .226
February	1.342	.796	— .546
March	2.744	1.648	— 1.096
April	3.540	3.933	+ .393
May	2.241	2.165	— .076
June	1.249	.843	— .406
July . . . . .	.759	.527	— .232
August . . . . .	.643	.405	— .238
September . . . . .	.633	.341	— .292
October . . . . .	.784	.509	— .275
November	1.098	1.395	+ .297
December	1.270	.872	— .398
Average for whole year	1.463	1.205	— .258

The following table gives the record of the flow of the Merrimack River at Lawrence for each of the past six years, together with the average flow for the past forty-seven years, this amount being expressed in cubic feet per second per square mile of drainage area:

Flow of the Merrimack River at Lawrence in Cubic Feet per Second per Square Mile.

MONTH.	1921.	1922.	1923.	1924.	1925.	1926.	Mean for Forty-seven Years, 1880-1926.
January	1.679	.830	1.074	1.964	.357	1.027	1.253
February . . . . .	.995	.887	.855	.978	1.882	.796	1.342
March	3.689	3.900	1.956	1.767	3.413	1.648	2.744
April	2.700	4.903	4.958	5.050	3.102	3.933	3.540
May	1.957	2.887	2.904	3.115	1.349	2.165	2.241
June . . . . .	.597	3.006	.730	.920	.689	.843	1.249
July	1.031	2.111	.434	.464	.712	.527	.759
August . . . . .	.683	.773	.394	.350	.518	.405	.643
September . . . . .	.425	.766	.303	.753	.454	.341	.633
October . . . . .	.475	.660	.491	.612	.735	.509	.784
November	1.057	.612	1.177	.536	1.067	1.395	1.098
December	1.652	.498	2.372	.712	1.577	.872	1.270
Average for whole year	1.412	1.819	1.471	1.435	1.321	1.205	1.463
Average for driest six months . . . . .	.711	.903	.588	.571	.696	.670	.861

Sudbury, Nashua and Merrimack Rivers.

The following table shows the weekly fluctuations during the year 1926 in the yield of the Sudbury River at Framingham, the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton, and the Merrimack River at Lawrence. The flow of these streams, particularly that of the Sudbury River and the South Branch of the Nashua River, serves to indicate the flow of other streams in eastern Massachusetts. The area of the Sudbury River watershed is 75.2 square miles, of the South Branch of the Nashua River 118.19 square miles, and of the Merrimack River at Lawrence 4,452 square miles.

Table showing the Average Weekly Flow of the Sudbury, South Branch of the Nashua and the Merrimack Rivers for the Year 1926, in Cubic Feet per Second per Square Mile of Drainage Area.

WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.	WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.
Jan. 3	2.235	.896	.756	Mar. 7	3.522	1.947	.972
10	1.080	1.264	.786	14	4.275	1.927	1.236
17 . . . . .	.706	.976	.709	21	3.006	1.842	1.165
24	2.674	2.769	1.805	28	5.700	5.373	2.615
31	2.250	1.136	.998				
Feb. 7	1.627	1.153	.789	Apr. 4	4.606	4.641	2.788
14	4.842	1.201	.715	11	4.539	5.632	3.417
21	7.818	1.088	.805	18	3.409	3.226	4.037
28	3.257	1.703	.875	25	1.961	2.539	3.696

Table showing the Average Weekly Flow of the Sudbury, etc. — Concluded.

WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merri- mack River.	WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merri- mack River.
May 2	1.681	2.318	5.259	Sept. 5	— .336	.226	.369
9	1.375	1.254	3.667	12	— .142	.291	.315
16	1.337	1.365	1.896	19 . . . .	.449	.209	.354
23	2.058	1.658	1.715	26	— .063	.465	.327
30	1.915	.688	1.176	Oct. 3	— .368	.293	.344
June 6	1.964	.811	.978	10	— .187	.357	.381
13 . . . .	.254	.631	.816	17 . . . .	.592	.357	.372
20 . . . .	.205	.576	.943	24 . . . .	.145	.882	.479
27 . . . .	.188	.690	.649	31	1.290	.925	.905
July 4	— .165	.275	.601	Nov. 7 . . . .	.344	.564	.662
11	— .281	.245	.436	14	1.495	1.352	1.479
18 . . . .	.008	.415	.734	21	1.996	2.159	1.877
25	— .056	.409	.462	28	2.547	1.353	1.505
Aug. 1	— .066	.599	.434	Dec. 5	4.574	1.043	1.289
8 . . . .	.835	.434	.404	12	1.231	.883	.838
15 . . . .	.485	.387	.465	19	1.601	.816	.839
22 . . . .	.985	.496	.408	26	1.440	.874	.735
29 . . . .	.276	.346	.378				

EXAMINATION OF RIVERS.

Aberjona River.

The examinations of the Aberjona River have shown in general more evidence of pollution than for a number of years. Early in the year the city of Woburn obtained legislation authorizing the construction of a sewer for the removal of the sewage and manufacturing wastes from that portion of the city lying within the valley of the main stream which are the chief causes of the pollution of this river. Subsequently an appropriation of \$100,000 was made for carrying out the work.

Assabet River.

The condition of the Assabet River above Hudson has shown a slight improvement during the past year, but below Hudson there has been more evidence of pollution than in any year since these observations were begun, with the exception of 1925. Below Maynard the stream has been in a worse condition than in any year since 1917. There has been considerable complaint during the year relative to the condition of the stream below Hudson, and during the latter part of the summer this portion of the course of the river was offensive. Progress has recently been made in the construction of works for the treatment of certain very objectionable wastes from an industrial works in Hudson which when completed should relieve the objectionable conditions in the future during periods of extended drouth.

Blackstone River.

This river continues to be very badly polluted by improperly purified sewage and industrial wastes which are discharged into it particularly in the upper portion of its course.

Examinations show that during the past year the condition of the river above the entrance of the effluent from the sewage disposal works at Worcester has been slightly better than in 1925, but there has been as yet no evidence of any marked improvement in the lower portion of its course such as was expected to take place following the operation of the new sewage disposal works at Worcester. Efforts are being made by the Worcester authorities to improve the efficiency of these works.

Charles River.

The results of the analyses of samples of water from the Charles River show a decided increase in pollution, especially in the lower part of its course. In general the condition of this stream has been worse than for many years.

Chicopee River and Tributaries.

The examinations and the analyses of the Quaboag River above Palmer show a slight increase in pollution, evidently due largely to certain industrial wastes, while below Palmer there was somewhat more evidence of pollution than in any recent year.

The Ware River shows little change as compared with other recent years, ex-

cepting in the middle portion of its course, where there was an increase in pollution as compared with earlier years.

The Chicopee River near its mouth showed evidences of somewhat greater pollution than in any recent year.

Concord and Sudbury Rivers.

Bannister Brook, a tributary of the Sudbury River, above Saxonville was seriously polluted during the early summer by the effluent from the sewage disposal works of Framingham and Natick, but this pollution was less marked during the latter part of the year. There was an improvement in the condition of the Sudbury River below Saxonville and also at its mouth. The Concord River showed less evidence of pollution than usual, but at its mouth it is still a very badly polluted stream.

Connecticut River.

The analyses of the waters of the Connecticut River show no material change from other recent years. There was an increase in the pollution of the Mill River below Northampton but above the sewer outlet, and the river is very badly polluted below the sewer outlet. There was an increase also in the pollution of the Manhan River below Easthampton compared with other recent years.

French River.

The condition of this stream below Webster and Dudley has been more objectionable than for many years. No definite action appears to have been taken as yet to forward the construction of a sewage disposal works for these towns plans for which were approved by this Department in 1925.

Hoosick River.

The results of the analyses of samples of water from the Hoosick River below North Adams and at Williamstown show that the condition of this river continues to be very objectionable, especially at Williamstown, where the pollution of the river was worse than in any year since 1918.

Housatonic River.

The examinations of this stream show in general a slight improvement in its condition throughout most of its course as compared with other recent years.

Merrimack River.

The gradual deterioration in the condition of this river, especially in the lower part of its course, has continued in general as in other recent years.

Complaint was made during the summer relative to the presence of oil and tar on the surface of the water and on the banks of the river. An investigation indicates that the cause of the complaint was due in part at least to an accident, but a further study to determine the sources of this pollution was in progress at the end of the year.

Millers River and Tributaries.

The Otter River below Gardner still shows marked evidence of pollution by sewage and improperly treated sewage effluent, regardless of the improvements that have been effected at the sewage disposal works of the city of Gardner. Further improvements are essential at these works in order to prevent the continued pollution of the river.

A sewerage system and sewage disposal works are being constructed in Winchendon which should prevent pollution of the tributaries of the Millers River below that town.

Little change has taken place in the condition of the river at Athol or Orange and the river receives comparatively little pollution below the latter point.

Nashua River.

Complaints have been made to this Department relative to the condition of the Nashua River, especially the North Branch, the condition of which has been more objectionable than in any recent year. The condition of the South Branch, also very badly polluted below Clinton, has shown little change as compared with the previous year. Farther down stream below the confluence of the two branches the condition of the river has been very objectionable and the pollution more marked,

judging from chemical analyses, than in any year since observations of the condition of this river were begun many years ago.

The principal source of pollution of the Nashua River is the sewage of the city of Leominster, which is discharged untreated directly into the stream or its tributaries. The river also receives small amounts of sewage from the city of Fitchburg and in the aggregate a great amount of polluting manufacturing waste in Fitchburg and Leominster. The South Branch is seriously polluted by wastes from Clinton, especially the sewage and effluent from the Clinton sewage disposal works, the operation of which has not been satisfactory during the past year. The city of Leominster has taken up the question of providing a system of sewage disposal, and the authorities of both Leominster and Fitchburg are cooperating with the Department in attempting to relieve the river of sewage and objectionable wastes. A material improvement is necessary in the sewage disposal works in Clinton, but this undertaking is being delayed to determine where the responsibility for the new work lies under existing laws.

Neponset River.

The results of the investigation of the condition of the river have shown in general that its condition has been growing worse and is now as objectionable as in earlier years before the various works were installed for the treatment of sewage and manufacturing waste. The Department has recommended that the best practicable way of effecting a permanent improvement in the condition of this river is to construct a sewer to serve the towns in the upper portion of the valley in connection with the South Metropolitan sewerage system.

Taunton River.

The condition of this river and its tributaries has shown little change as compared with the previous year. The Three Mile River has shown a marked increase in pollution near its mouth due to industrial waste, and the Rumford River, one of its main tributaries, has been the source of complaint from a similar cause.

Ten Mile River.

The condition of this river varies considerably from year to year due very largely to the quantity of industrial wastes discharged into the river in the towns through which it flows. The sewage of both North Attleborough and Attleboro, the principal towns in the valley, is treated at disposal works before it is discharged into the river.

EXAMINATION OF SEWAGE DISPOSAL WORKS.

At Attleboro the sewage has been distributed more thoroughly over the entire disposal area than in past years, and the results of operation have been satisfactory.

At Brockton the new disposal works have been used for the treatment of practically all of the sewage of the city throughout the year. During most of the year the effluent from the secondary tanks has been discharged upon the sand filter beds, several of which have been reconstructed to serve as strainer beds for this effluent. Additional beds have been reconstructed during the past year which will be used for the same purpose.

The quantity of sewage discharged upon the filters at Clinton is greater than they are capable of treating satisfactorily, and considerable quantities of untreated sewage have overflowed from these works into the South Branch of the Nashua River. No material changes have been effected at this plant in recent years.

At Easthampton all of the sewage is passed through the settling tanks. The day flow during the warmer months is filtered, but the night flow of settled sewage and all the settled sewage in the colder months of the year are discharged into the Manhan River without further treatment.

A new grit chamber has been under construction during the year at Fitchburg and was ready for operation at the end of the year.

At Framingham the Imhoff tanks and the eight acres of new sand filters have been in constant use during the year. In some of the filters reconstruction work has been carried on while other filters have shown evidence of clogging, and an investigation was made during the year to determine the cause. The results indicated that the material in some of the filters is finer than is desirable, and the Department has recommended certain improvements.

The Franklin sewage disposal works have operated satisfactorily, but the sewage is not distributed to the filters as evenly as desirable in order to secure the best results.

The condition of the sewage disposal works at Gardner has remained about the same as in previous years. The purification of the sewage is not wholly satisfactory, and the discharge of more or less imperfectly purified effluent has continued as in previous years. The underdrainage system in most of the beds has been relaid during the year and new sand has been placed on several of the beds, but additional work is essential both at the disposal works and in relaying some of the sewers to reduce leakage into the system in order to prevent further pollution of the river.

At Milford the various units of the sewage disposal works, including Imhoff tanks and a trickling filter with an area of 0.28 of an acre which were put into operation in 1924, have been operated during the year. The secondary tank and the necessary sludge pumps were completed during the year, but the Imhoff tanks have not operated satisfactorily due in part to lack of proper expert attention. Considerable quantities of poorly purified sewage have overflowed from this section of the plant into the Charles River during the year, and complaint has been made relative to the condition of the river below Milford. The sand filter beds have operated with reasonable satisfaction during the year, though the effluent has not shown as high a degree of purification as in past years.

At Natick conditions have been slightly better than in previous years. The underdrainage system in about half the filter beds has been relaid during the year and some resurfacing has been done. There has been a material reduction in the quantity of sewage requiring disposal due to the relaying of some of the sewers and the exclusion of ground water, but the disposal works are still inadequate for the proper treatment of all the sewage of the town.

At Norwood the filter beds have been in regular use throughout the year, but considerable settled sewage has been discharged into a swamp outside the filter beds, and some crude sewage has overflowed directly into the river. The area of the filters is not sufficient for the proper treatment of all the sewage of the town. A new filter bed with an area of about an acre constructed of material hauled in from a distance was put into operation during the latter part of the year.

The sewage disposal works at Pittsfield have become inadequate for the effective treatment of the quantity of sewage discharged from the city. The new pumping machinery consisting of two motor driven centrifugal pumps which were installed during the year 1925 has operated satisfactorily and less untreated sewage has been discharged into the Housatonic River at the pumping station than in recent years. As a result the filter beds have been more overloaded than usual. Investigations relative to the extension of the filter beds were under way during the year.

At Southbridge six new filter beds with an aggregate area of four acres, the construction of which was begun in 1925, have been completed and were used during the latter half of the year. The disposal works of this town are still inadequate for the proper treatment of all the sewage of the town and more or less sewage is discharged without treatment into the Quinebaug River.

The area of filters at Westborough is inadequate for the treatment of all the sewage and untreated or imperfectly purified sewage has overflowed at times into the Assabet River.

The use of the old disposal works at Worcester was discontinued in 1925, and the new works have been in use throughout the year 1926. Considerable construction work has been going on during the past year to complete the new works. The quantity of sludge collecting in the Imhoff tanks has been abnormal, due in part at least to the presence of large quantities of industrial wastes, and much pooling has occurred on the surface of the trickling filters. Septic action has taken place in the secondary tanks, causing a discharge of solid matter with the final effluent, and the efficiency of the new works has not yet become satisfactory. Efforts are being made to effect the necessary improvement in the operation of the works.

The other larger municipal sewage disposal works have been in reasonably satisfactory condition during the year, but extensions are required at some of the smaller works.

The average results of the analyses of sewage and effluent, together with statistics concerning the more important sewage disposal works, are presented in the following tables:

TABLE No. 1. — *Average Results of the Analyses of Monthly Samples of Sewage as received at Disposal Works.* (Fats determined in about 64 Per Cent of the Samples.)

[Parts in 100,000.]

CITY OR TOWN.	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.	OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.				Unfil-tered.	Fil-tered.	Unfil-tered.	Fil-tered.		
	Total.	Dis-solved.	Sus-pended.	Total.	Dis-solved.	Sus-pended.											
ATTLEBORO ¹	42.20	32.97	9.23	20.00	12.97	7.03	2.82	.58	.34	.24	4.95	4.57	2.38	.198	.084	1.16	-
BROCKTON ²	35.87	30.75	5.12	16.17	12.03	4.14	3.59	.32	.26	.26	5.64	3.56	2.09	.100	.043	1.06	3.81
Clinton ²	130.87	69.68	61.19	80.37	34.08	46.29	3.72	1.94	.74	.90	5.96	18.73	7.91	.170	.008	3.42	34.96
Concord ¹	38.43	29.53	8.90	18.23	10.43	7.80	2.88	.47	.25	.22	5.62	3.48	1.72	.091	.046	.93	-
Easthampton ¹	46.23	32.00	14.23	23.23	11.67	11.56	2.76	.58	.26	.32	4.78	4.70	2.35	.133	.061	1.12	-
FITCHBURG	51.65	30.20	21.45	25.62	12.75	12.87	2.29	.58	.34	.24	4.47	5.75	2.89	.530	.140	1.07	8.68
Frammingham (Imhoff) ³	67.95	47.96	19.99	33.38	19.49	13.89	4.14	1.06	.68	.38	8.35	7.12	4.38	.154	.070	1.78	8.37
Frammingham ²	92.80	52.35	40.45	51.53	23.73	27.80	5.18	1.70	1.12	.58	7.08	15.11	5.46	.315	.080	3.14	13.76
Franklin ¹	42.33	32.14	10.19	19.13	10.47	8.66	3.17	.52	.31	.21	5.89	3.59	2.31	.106	.045	1.07	-
GARDNER (Gardner Area) ⁴	95.30	62.25	33.05	54.20	26.80	27.40	10.10	1.80	.98	.82	12.36	15.90	7.28	.159	.074	3.34	17.09
GARDNER (Templeton Area)	80.08	45.15	34.93	48.63	17.38	31.25	7.88	1.29	.67	.62	8.72	10.28	3.89	.205	.059	2.62	14.03
Hopedale ^{1,2}	52.16	33.56	18.60	29.84	14.00	15.84	5.90	.92	.52	.40	5.66	7.13	2.90	.140	.050	1.80	-
Hudson ¹	76.83	40.62	36.21	48.83	17.15	31.68	8.23	1.28	.62	.66	6.42	9.20	3.70	.139	.055	2.49	16.78
Leicester ⁴	45.95	28.70	17.25	22.40	13.50	8.90	3.04	.57	.37	.20	3.20	4.62	2.90	.140	.053	1.22	-
Marion ¹	47.10	24.70	22.40	31.53	11.47	20.06	1.97	.72	.40	.32	3.90	4.53	2.52	.075	.030	1.38	-
MARLBOROUGH	75.82	49.83	25.99	41.48	20.35	21.13	3.96	1.02	.51	.51	8.87	8.67	3.76	.200	.069	1.82	14.98
Milford ⁵	48.97	35.15	13.82	24.25	13.02	11.23	4.20	.62	.30	.32	5.94	4.25	2.19	.106	.045	1.16	-
Natick ²	60.14	44.72	15.42	25.67	13.25	12.42	3.74	.62	.28	.34	9.00	4.43	2.08	.121	.047	1.28	5.71
North Attleborough ¹	33.93	27.07	6.86	16.37	10.70	5.67	2.15	.48	.24	.24	3.73	2.98	1.73	.083	.045	.81	-
Northbridge ¹	43.33	26.06	17.27	26.37	12.23	14.14	5.59	1.03	.59	.44	3.37	5.47	2.85	.085	.024	1.87	-
Norwood	77.97	53.09	24.88	32.32	16.38	15.94	2.77	.73	.27	.46	14.81	9.74	5.69	.095	.057	1.48	12.44
PITTSFIELD ²	50.08	39.65	10.43	24.13	15.83	8.30	3.01	.54	.27	.27	6.09	5.12	2.87	.112	.050	1.09	5.59
Southbridge ¹	64.03	38.77	24.26	37.00	17.13	19.87	4.35	.78	.30	.48	6.05	6.23	3.07	.109	.054	1.62	15.08
Spencer ¹	91.93	38.80	53.13	58.53	18.67	39.86	4.60	1.80	.96	.84	6.44	14.93	5.09	.393	.079	3.72	20.00
Stockbridge ⁴	28.30	24.85	3.45	13.20	10.55	2.65	1.89	.23	.13	.10	1.34	2.24	1.53	.045	.018	.42	-
Westborough	57.59	37.15	20.44	32.27	16.70	15.57	3.83	.82	.46	.36	4.50	7.41	3.23	.100	.046	1.63	11.00
Worcester ⁶	97.00	67.28	29.72	34.65	15.73	18.92	2.04	.62	.17	.45	9.74	9.60	3.45	.680	.3219	1.61	-

¹ Six samples.

² At pumping station.

³ Entrance to Imhoff tanks, including Saxonville sewage.

⁴ Four samples.

⁵ Eleven samples.

⁶ Eight samples.

TABLE No. 2. — *Average Results of the Analyses of Monthly Samples of Sewage as Applied to Filter Beds after Preliminary Treatment as Indicated. (Fats determined in about 64 Per Cent of the Samples.)*

[Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	RESIDUE ON EVAPORATION.				AMMONIA.			OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.			
		TOTAL RESIDUE.			LOSS ON IGNITION.			ALBUMINOID.			Chlorine.				Unfiltered.		Filtered.
		Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.	Suspended.	Unfiltered.			Filtered.		
ATTLEBORO ¹ .	None	42.20	32.97	9.23	20.00	12.97	7.03	2.82	.58	.34	.24	4.95	4.57	2.38	1.98	.084	1.16
BROCKTON	Tanks	34.98	30.30	4.68	14.85	11.60	3.25	3.51	.43	.23	.20	6.19	3.13	1.96	.092	.050	.88
Clinton	Basins	56.90	48.56	8.34	28.10	22.28	5.82	2.92	.63	.43	.20	5.07	6.19	4.71	1.21	.060	1.22
Concord ¹	None	38.43	29.53	8.90	18.23	10.43	7.80	2.88	.47	.25	.22	5.62	3.48	2.02	.091	.046	.93
Easthampton ¹	Tanks	47.23	37.87	9.36	23.10	15.20	7.90	3.21	.51	.29	.22	5.93	4.88	2.62	.098	.043	1.13
FITCHBURG	Imhoff	34.37	28.76	5.61	14.40	11.18	3.22	2.25	.43	.24	.19	4.34	3.37	2.31	.313	.146	.80
Frammingham	Imhoff	48.90	42.84	6.06	21.76	17.20	4.56	3.67	.71	.46	.25	6.69	4.69	3.23	.134	.051	1.19
Franklin ¹	Tanks	29.57	27.70	1.87	10.07	9.03	1.04	2.60	.29	.18	.11	4.95	2.02	1.48	.061	.041	.62
GARDNER (Gardner Area)	None	95.30	62.25	33.05	54.20	26.80	27.40	10.10	1.80	.98	.82	12.36	15.90	7.28	.159	.074	3.34
GARDNER (Templeton Area)	Tanks	49.30	38.58	10.72	24.20	15.75	8.45	5.44	.57	.34	.23	6.89	5.03	3.03	.123	.053	1.35
Hopedale ¹	Tanks	36.33	28.60	7.73	17.80	11.70	6.10	4.84	.50	.29	.21	4.61	4.12	2.33	.123	.057	.97
Hudson	Tanks	42.73	36.00	6.73	20.17	15.02	5.15	4.20	.52	.27	.25	5.90	4.03	2.63	.098	.040	1.00
Leicester ²	None	45.95	28.70	17.25	22.40	13.50	8.90	3.04	.37	.37	.20	3.20	4.62	2.90	.140	.053	1.22
Marion ¹	None	41.00	24.70	22.40	31.53	11.47	20.06	1.97	.72	.40	.32	3.90	4.53	2.52	.075	.030	1.38
MARLBOROUGH	Tanks	64.38	50.68	13.70	30.22	19.12	11.10	5.00	.84	.52	.32	9.67	6.89	3.86	.124	.061	9.00
Milford ³	Tanks	48.04	41.51	6.53	20.84	16.00	4.84	4.89	.52	.27	.25	8.43	4.03	2.52	.085	.042	.93
Milford	Imhoff	36.60	32.40	4.20	14.64	11.49	3.15	3.02	.40	.20	.20	5.88	2.55	1.49	.083	.038	.72
Natick	None	60.14	44.72	15.42	25.67	13.25	12.42	3.74	.62	.28	.34	9.00	4.43	2.08	.127	.047	5.71
North Attleborough ¹	Tanks	25.93	23.63	2.30	10.57	8.83	1.74	2.07	.30	.21	.09	3.32	2.03	1.17	.072	.038	.55
Northbridge ¹	Tanks	20.97	17.30	3.67	9.70	7.87	1.83	1.91	.32	.18	.14	2.35	2.07	1.08	.079	.046	.65
Norwood	Tank	77.25	52.19	25.06	30.81	16.33	14.48	3.10	.66	.26	.40	13.37	7.27	3.80	.139	.055	1.46
PITTSFIELD	None	50.08	39.65	10.43	24.13	15.83	8.30	3.01	.54	.27	.27	6.09	5.12	2.87	.112	.050	1.09
Southbridge ¹	Tanks	56.77	44.53	12.24	27.33	17.53	9.80	5.70	.73	.42	.31	8.87	5.23	2.87	.113	.040	1.54
Spencer ¹	None	91.93	38.80	53.13	58.53	18.67	39.86	4.60	1.80	.96	.84	6.44	14.93	5.09	.393	.079	3.72
Stockbridge	None	28.30	24.85	3.45	13.20	10.55	2.65	1.89	.23	.13	.10	1.34	2.24	1.53	.045	.018	.42
Westborough	None	57.59	37.15	20.44	32.27	16.70	15.57	3.83	.82	.46	.36	4.50	7.41	3.23	.100	.046	1.63
Worcester ⁴	Imhoff	66.37	52.97	13.40	15.87	9.40	6.47	2.49	.37	.15	.22	9.98	4.60	2.27	3.275	.012	.82

¹ Six samples.

² Four samples.

³ Eleven samples.

⁴ Eight samples.

TABLE No. 3. — *Efficiency of Settling Tanks and Other Forms of Preliminary Treatment as indicated by the Foregoing Tables.*
 [Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	SUSPENDED SOLIDS.			TOTAL ALBUMINOID AMMONIA.			OXYGEN CONSUMED.			FATS. ¹			CHLORINE.	
		Haw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Haw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Haw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Haw Sewage.	Settled or Treated Sewage.	Per Cent removed.	Haw Sewage.	Settled or Treated Sewage.
BROCKTON	Tanks	5.12	4.68	9	.52	.43	17	3.56	3.13	12	3.81	2.58	32	5.64	6.19
Clinton	Basins	61.19	8.34	86	1.64	.63	62	18.73	6.19	67	34.96	8.72	75	5.96	5.07
Easthampton	Tanks	14.23	9.36	34	.58	.51	12	4.70	4.88	41	8.68	3.52	59	4.78	5.93
Fitchburg	Imhoff	21.45	5.61	74	.58	.43	26	5.75	3.37	34	8.37	3.71	56	4.47	4.34
Frammingham?	Imhoff	19.99	6.06	70	1.06	.71	33	7.12	4.69	34	8.37	3.71	56	8.35	6.69
Franklin	Tanks	10.19	1.87	82	.52	.29	44	3.59	2.02	44	—	—	—	5.89	4.95
GARDNER (Templeton Area)	Tanks	34.93	10.72	69	1.29	.57	56	10.28	5.03	51	14.03	6.95	50	8.72	6.89
Hopedale	Tanks	18.60	7.73	58	.92	.50	46	7.13	4.12	42	—	—	—	5.06	4.61
Hudson	Tanks	36.21	6.73	87	1.28	.52	59	9.20	4.03	56	16.78	4.41	74	6.42	5.90
MALBOROUGH	Tanks	25.99	13.70	47	1.02	.84	18	8.67	6.89	21	14.98	9.00	40	8.87	9.67
Milford	Tanks	13.82	6.53	53	.62	.52	16	4.25	4.03	5	—	—	—	5.94	8.43
Milford	Imhoff	13.82	4.20	70	.62	.40	35	4.25	2.55	40	—	—	—	5.94	5.88
North Attleborough	Tanks	6.86	2.30	66	.48	.30	38	2.98	2.03	32	—	—	—	3.73	3.32
Northbridge	Tanks	17.27	3.67	79	1.03	.32	69	5.47	2.07	61	—	—	—	3.37	2.35
Norwood	Tank	24.88	25.06	—	.73	.66	9	9.74	7.27	25	12.44	9.85	21	14.81	13.37
Southbridge	Tanks	24.26	12.24	50	.78	.73	6	6.23	5.23	16	15.08	8.30	45	6.05	8.87
WORCESTER	Imhoff	29.72	13.40	55	.62	.37	40	9.60	4.60	52	—	—	—	9.74	9.59

¹ Fats determined in about 64 per cent of the samples.

² The analyses of the comparatively small quantity of sewage from Saxonville not used in determining the efficiency of these tanks.

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc.*
[Parts in 100,000.]
Brockton.

	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.	NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.	
	TOTAL RESIDUE.			LOSS ON IGNITION.			ALBUMINOID.					Nitrates.	Nitrites.	Unfiltered.	Filtered.				
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.	Suspended.									
Settled sewage as applied to trickling filter.	34.98	30.30	4.68	14.85	11.60	3.25	3.51	.43	.23	.20	6.19	—	—	3.13	1.96	.88	2.58	Trickling filter has an area of 2.0 acres and a depth of 10 feet of stone from 1.5 to 3 inches in size.	
Effluent from trickling filter.	41.15	35.25	5.90	16.12	11.78	4.34	1.94	.32	.14	.18	7.30	1.4568	.0286	2.83	1.38	.68	1.57	One-half of filter used alternately. The average rate of operation was about 1,347,000 gallons per acre per day.	
Per cent removed by Settled effluent from trickling filter.	—	34.75	4.20	—	11.15	2.33	2.31	.27	.15	.12	—	—	—	2.44	1.45	.57	1.49	Period of sedimentation averages about 1.37 hours.	
Per cent removed by tank.	5	1	29	16	5	45	—	16	—	33	—	—	—	14	—	16	5		
Per cent removed by trickling filter and settling tank.	—	—	10	9	4	28	34	37	35	40	—	—	—	22	26	35	42	Tanks cleaned 52 times.	

TABLE No. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester and of their Effluents, etc., Per Cent Removed, etc. — Concluded.*

[Parts in 100,000.]

Fitchburg.

	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.		NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			ALBUMINOID.												
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.	Suspended.									
Imhoff tank effluent as applied to trickling filters.	34.37	28.76	5.61	14.40	11.18	3.22	2.25	.43	.24	.19	4.34	—	3.37	2.31	.80	3.52	Trickling filter has an area of 2.14 acres and a depth of 10 feet of stone from 1 to 3 inches in size. The average rate of operation was about 1,779,000 gallons per day for area used (1.86 acres).		
Effluent from trickling filter.	28.43	25.82	2.61	11.98	10.68	1.30	.50	.16	.08	.08	3.94	.0073	1.53	.94	.39	—	—		
Per cent removed	17	10	53	17	4	60	78	63	67	58	9	—	55	59	51	—	—		
Settled effluent from trickling filter as discharged to Nashua River.	30.13	26.68	3.45	12.12	10.45	1.67	.58	.16	.09	.07	4.73	.0112	1.59	1.03	.36	—	—		
Per cent removed by secondary settling tanks.	—	—	—	—	22	—	—	—	—	13	—	—	—	—	8	—	Period of sedimentation about 6 hours.		
Per cent removed by trickling filter and secondary tanks.	12	7	39	16	7	48	74	63	63	63	—	—	53	55	55	—	—		

Milford.

Imhoff tank effluent as applied to trickling filter.	36.60	32.40	4.20	14.64	11.49	3.15	3.02	.40	.20	.20	5.88	-	2.55	1.49	.72	-	Trickling filter has an area of .28 of an acre and a depth of 6 feet of stone from 1 to 1¾ inches in size.
Effluent from trickling filter.	39.35	34.33	5.42	16.13	11.82	4.31	1.32	.26	.13	.13	6.25	1.4228	1.91	1.14	.51	-	
Per cent removed	-	-	-	-	-	-	56	35	-	-	-	-	25	24	29	-	

Worcester.

Imhoff tank effluent as applied to trickling filters.	66.37	52.97	13.40	15.87	9.40	6.47	2.49	.37	.15	.22	9.59	-	4.60	2.27	.82	-	Trickling filters have an area of 13.68 acres and a depth of 10 feet of stone from 1¼ to 3 inches in size. The average rate of operation was about 1,000,000 gallons per acre per day.
Effluent from trickling filters.	58.37	50.20	8.17	11.67	7.63	4.04	1.93	.22	.10	.12	9.71	.1532	2.53	1.19	.53	-	
Per cent removed	12	5	39	26	19	38	22	41	33	45	-	-	45	48	35	-	
Settled effluent from trickling filters as discharged to Blackstone River.	56.73	49.98	6.75	10.78	8.05	2.73	1.97	.20	.09	.11	9.66	.1925	2.16	1.21	.28	-	Period of sedimentation averaged about 1.6 hours. Tanks cleaned 4 times.
Per cent removed by secondary settling tanks.	3	.4	17	8	-	32	-	9	10	8	.5	-	15	-	47	-	
Per cent removed by trickling filters and secondary tanks.	15	6	50	32	14	58	21	46	40	50	-	-	53	47	66	-	

TABLE NO. 5. — *Average Results of Analyses of Monthly Samples of Effluent from Sand Filters.*

[Parts in 100,000.]

CITY OR TOWN.	Free Ammonia.	Total Albuminoid Ammonia.	Chlorine.	NITROGEN AS —		Iron.
				Nitrates.	Nitrites.	
ATTLEBORO ¹ . . . . .	.75	.0712	4.72	1.3617	.0125	.032
BROCKTON ²	1.63	.0704	6.35	1.3339	.0178	.476
Clinton ²	2.11	.0821	4.58	.1114	.0020	1.327
Concord ¹ . . . . .	.08	.0186	4.21	1.4735	.0036	.016
Easthampton ¹ . . . . .	.06	.0280	3.32	1.6997	.0314	.045
Framingham ² (Imhoff)	1.79	.1100	6.74	1.0855	.0326	.346
Framingham (Direct)	3.33	.1124	6.81	.2527	.0200	1.054
Franklin	1.28	.1220	6.42	.4558	.0550	.522
GARDNER (Gardner Area) ³	3.31	.1750	9.21	.0737	.0079	1.105
GARDNER (Templeton Area) ²	4.12	.2179	7.78	.7400	.0308	.761
Hopedale ²	1.30	.0873	4.27	2.1293	.0019	.029
Hudson	1.33	.1085	5.62	1.5188	.0168	.223
Leicester ³	1.14	.0898	3.59	.7018	.0365	.173
Marion ¹	1.07	.0683	3.75	.2187	.0287	.404
MARLBOROUGH ² . . . . .	.91	.0810	6.86	1.9043	.0129	.206
Milford ⁴	2.64	.1119	7.15	.3645	.0119	.644
Natick	3.00	.0950	8.47	.1797	.0470	.656
North Attleborough ¹ . . . . .	.34	.0285	3.15	.4447	.0098	.171
Northbridge ¹ . . . . .	.68	.0625	2.97	.5610	.0104	.519
Norwood ²	1.15	.0825	9.42	.1551	.0115	.550
PITTSFIELD ²	1.19	.1875	5.28	.3011	.0155	.478
Southbridge ²	2.60	.1148	8.00	.0564	.0061	1.088
Spencer ¹ . . . . .	.75	.0526	4.81	.1993	.0007	.780
Stockbridge ² . . . . .	.31	.0484	2.12	.2805	.0301	.091
Westborough ²	1.33	.1099	6.97	.2310	.0164	.763

¹ Six samples.² Regular samples from two or more underdrains in one average.³ Four samples.⁴ Eleven samples.TABLE NO. 6. — *Efficiency of Sand Filters. (Per Cent of Free and Albuminoid Ammonia removed.)*

[Parts in 100,000.]

CITY OR TOWN.	FREE AMMONIA.			TOTAL ALBUMINOID AMMONIA.			CHLORINE.		Rate of Operation with Even Distribution (Gallons per Acre per Day). ¹
	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	
ATTLEBORO	2.82	.75	73	.58	.0712	88	4.95	4.72	59,000
BROCKTON	3.51	1.63	54	.43	.0704	84	6.19	6.35	-
Clinton	2.92	2.11	28	.63	.0821	87	5.07	4.58	51,000
Concord	2.88	.08	97	.47	.0186	96	5.62	4.21	85,000
Easthampton	3.21	.06	98	.51	.0280	95	5.93	3.32	-
Framingham (Imhoff)	3.67	1.79	51	.71	.1100	85	6.69	6.74	40,000
Framingham (Direct)	5.18	3.33	36	1.70	.1124	93	7.08	6.81	
Franklin	2.60	1.28	51	.29	.1220	58	4.95	6.42	54,000
GARDNER (Gardner Area)	10.10	3.31	67	1.80	.1750	90	12.36	9.21	-
GARDNER (Templeton Area)	5.44	4.12	24	.57	.2179	62	6.89	7.78	-
Hopedale	4.84	1.30	74	.50	.0873	83	4.61	4.27	47,000
Hudson	4.20	1.33	68	.52	.1085	79	5.90	5.62	51,000
Leicester	3.04	1.14	63	.57	.0898	84	3.20	3.59	-
Marion	1.97	1.07	46	.72	.0683	91	3.90	3.75	130,000
MARLBOROUGH	5.00	.91	82	.84	.0810	90	9.67	6.86	44,000
Milford	4.89	2.64	46	.52	.1119	78	8.43	7.15	30,000
Natick	3.74	3.00	20	.62	.0950	85	9.00	8.47	49,000
North Attleborough	2.07	.34	84	.30	.0285	91	3.32	3.15	95,000
Northbridge	1.91	.68	64	.32	.0625	80	2.35	2.95	60,000
Norwood	3.10	1.15	63	.66	.0825	88	13.37	9.42	88,000
PITTSFIELD	3.01	1.19	60	.54	.1875	65	6.09	5.28	101,000
Southbridge	5.70	2.60	54	.73	.1148	84	8.87	8.00	67,000
Spencer	4.60	.75	84	1.80	.0526	97	6.44	4.81	-
Stockbridge	1.89	.31	84	.23	.0484	79	1.34	2.12	-
Westborough	3.83	1.33	65	.82	.1099	87	4.50	6.97	61,000

¹ See also Table No. 7.

TABLE No. 7. — *Extent of Sewerage Works, Rate of Flow, and Rate of Operation of Sand Filters.*

CITY OR TOWN.	Popu- lation, Census of 1925.	Approx- imate Length of Sanitary Sewers (Miles).	Approx- imate Number of House Con- nections.	ESTIMATED QUANTITY OF SEWAGE TREATED (GALLONS PER DAY).			Estimated Average Quantity of Sewage per Connection.	Net Area of Filter Beds.	Estimated Rate of Operation with Even Dis- tribution (Gallons per Acre per Day).
				Average for Year.	Average for Month of Maximum Flow.	Average for Month of Minimum Flow.			
ATLEROBO	20,623	35.18	1,518	913,000	1,257,000	613,000	601	15.50	59,000
BROCKTON	63,343	97.44	8,843	3,140,000 ¹	5,179,000	2,098,000	355	37.00	—
Clinton	14,180	24.55	1,884	1,337,000 ²	2,012,000	1,063,000	729	26.23	51,000
Concord	7,056	8.95	513	365,000	527,000	264,000	712	4.28	85,000
Easthampton	11,587	20.84	1,133	—	—	—	—	2.20	—
FITCHBURG	43,609	—	—	3,310,000	4,650,000 ³	2,880,000 ⁴	—	—	—
Frammingham	21,078	35.10	2,979	1,174,000	1,739,000	829,000	394	29.12	40,000
Franklin	7,055	14.20	770	175,000	247,000	111,000	227	3.24	54,000
GARDNER	18,730	33.19	2,313	—	—	—	—	12.50	—
Hopedale	3,165	6.15	352	178,000 ⁵	250,000	116,000	506	3.79	47,000
Hudson	8,130	13.58	1,011	455,000	627,000	326,000	450	9.00	51,000
Marion	1,271	3.93	187	98,000	125,000	69,000	524	0.75	131,000
MARLBOROUGH	16,236	34.94	2,472	914,000	1,912,000	467,000	370	20.90	44,000
Milford	14,781	19.96	1,573	280,000 ⁶	473,000	128,000	178	9.30	30,000
Natick	12,871	12.21	1,507	617,000	1,055,000	371,000	409	12.60	49,000
North Attleborough	9,700	17.23	764	688,000	826,000	585,000	874	7.00	95,000
Northbridge	10,051	15.34	852	718,000	731,000	678,000	842	12.00	60,000
Norwood	14,151	23.32	1,712	1,268,000	1,716,000	923,000	741	14.47	88,000
Pittsfield	46,877	69.04	5,880	4,172,000	4,386,000	3,846,000	710	41.15	101,000
Southbridge	15,489	—	—	838,000	1,180,000	829,000	—	12.50	67,000
Westborough	6,348	7.90	568	353,000	914,000	226,000	600	5.80	61,000
WORCESTER	192,242	282.33 ⁷	—	22,500,000	—	—	—	—	—

¹ Minimum day.² New development not included in average.³ Records questionable. Amount treated by sand filters only.⁴ Includes 70 miles of combined sewers.⁵ Includes an average of 2,695,000 gallons per day to trickling filter and 445,000 gallons to sand filters.⁶ Entire quantity of sewage not treated.⁷ Maximum day.

TABLE No. 8. — *General Features.*

CITY OR TOWN.	Year of Construction of and Additions to Works.	Depth of Under-drains (Feet).	Distance of Apart of Under-drains (Feet).	Filtering Material.	Attention given to Disposal Works.
ATTLEBORO	1912, 1913	4-7	35	Excellent sand and gravel; found in place	One man all the time; others when necessary.
BROCKTON	1893, 1905, 1908, 1912	5.5	30	Good sand and gravel; found in place	One chemist in charge, foreman, day and night man, more when necessary.
Clinton	1898, 1899	8	60-70	Good sand and gravel; found in place	Two men all the time; others when necessary.
Concord	1899	none	—	Good sand underlaid with gravel; found in place	One man once a day.
Easthampton	1908	3.5	20-40	Good sand and gravel; largely found in place	One man all the time; others when necessary.
FITCHBURG	1914	—	—	Trickling filter — 10 feet deep	Chemist in charge; 1 foreman, 1 day and 2 night men.
Framingham	1890, 1924	—	—	Good sand and gravel	—
Franklin	1915	4.5	26	Good sand and gravel	Very little attention; one man once in a while.
GARDNER (Gardner Area)	1891	5	20	Good sand; handled in construction	One man all the time; others when necessary.
GARONER (Templeton Area)	1901, 1909	3-4	20-30	Coarse sand; handled in construction	One man all the time; others when necessary.
Hopedale	1900, 1923	3	35-60	Good material — sand and gravel	One man all the time; others when necessary.
Hudson	1904, 1910	5-6	50-100	Good sand and gravel; found in place	One man all the time; others when necessary.
Leicester	1894	4	8	Hard, compact sand; found in place	Very little attention.
Marion	1906	5	—	Mostly good sand; pockets of fine sand and some ledge; largely found in place	One man every day in summer, every other day in winter.
MARLBOROUGH	1891, 1908, 1909, 1910, 1911	4.5-6	30-50	Rather fine sand; found in place	One man all the time; others when necessary.
Milford	1907, 1924	5	40	Rather fine sand; found in place; trickling filter	One man every day; others when necessary.
Natick	1896	6	36	Sand of good quality, but stratified; found in place	One man all the time; others when necessary.
North Attleborough	1909, 1910	5-6.5	55	Coarse sand and gravel; found in place	One man every day; others when necessary.
Northbridge	1906, 1907, 1920	4	50-75	Coarse sand and gravel; mostly handled	Two men all the time; others when necessary.
Norwood	1909, 1918, 1923, 1924	4-6	40	Good sand and gravel; partly handled	One man all the time; others when necessary.
PITTSFIELD	1901, 1915	4	35	Good sand; mostly found in place	Two men all the time; others when necessary.
Southbridge	1908	4	40	Fair sand and gravel; considerable quantity handled, some found in place.	One man part of every day.
Spencer	1897, 1923	— ¹	—	Good sand and gravel; largely found in place	One man all the time; others when necessary.
Stockbridge	1899, 1921, 1922	3-4.5	23	Sand filters, good quality sand	One man all the time.
Westborough	1892, 1911	3-4.5	30-40	Irrigation area, rather fine sand	One man all the time.
WORCESTER	1898 ^{2, 3}	5	35-50	Good sand and gravel; handled in construction	One man all the time; others when necessary.
		4-6		Good sand and gravel; largely found in place	Several men all the time; large force spring and fall.

¹ Only three beds underdrained.² Year of first construction of sand filters.³ Sedimentation tanks and sand beds abandoned June, 1925. Imhoff tanks, trickling filters and secondary tanks installed.

Many additions.

EXAMINATION OF SEWER OUTLETS DISCHARGING INTO THE SEA.

Considerable progress has been made in the construction of the new outfall sewer for the city of Lynn. Plans were presented and approved by the Department during the year for deep sea outfall sewers at Marblehead and Gloucester and for the South Essex Sewerage District which comprises the cities of Salem, Peabody and Beverly, the town of Danvers, and certain public institutions in Danvers and Middleton.

Special examinations were made during the year in the vicinity of the outlet of the South Metropolitan Sewerage District, and many of the other main outlets have been inspected during the year.

WATER SUPPLY OF MUNICIPALITIES IN THE COUNTY OF ESSEX AND IN ADJACENT PORTIONS OF THE COUNTY OF MIDDLESEX.

In accordance with the requirements of Chapter 39 of the Resolves of the year 1926, the Department investigated the water supply needs and resources of the municipalities of the County of Essex and adjacent portions of the County of Middlesex and submitted a report to the Legislature on December 15, 1926, which was printed as House Document No. 211 of the year 1927.

The report recommended a more complete investigation of the water supply needs of the cities in the Merrimack River valley, including the city of Lowell, and especially a study of the possibility of supplying the latter city with water from local sources. The investigation also included a consideration of the needs of the municipalities in the southern portion of Essex County and recommended a continuation of the investigation which had not been completed within the time allowed.

NEPONSET VALLEY SEWER.

Under the provisions of Chapter 43 of the Resolves of 1926, the Department investigated during the year the desirability and probable cost of the extension of the South Metropolitan sewerage system to serve towns in the upper part of the valley of the Neponset River, and the report of the results of this investigation, together with plans and estimates of cost, was presented to the Legislature as required by the resolve and has been printed as House Document No. 212 of the year 1927.

WATER SUPPLY AND SEWERAGE OF STATE SANATORIA.

Plans and estimates were made by this Division during the year for improvements in the sewerage systems and sewage filters at the Lakeville, North Reading and Westfield State Sanatoria.

The new water supply at the Lakeville Sanatorium constructed by this Division was practically completed at the end of the year.

Special investigations have been made at the Cancer Hospital at Norfolk relative to water supply and sewage disposal. The sewerage system and sewage filter beds at this institution which had been constructed originally of inferior materials were very largely reconstructed under the supervision of this Division during the latter part of the year.

NOISOME TRADES.

In response to a petition relative to offensive odors arising from certain manufacturing establishments in Everett, the Department held a hearing early in the year, and this matter has been under investigation throughout much of the year. Certain improvements have been effected which have afforded relief from the conditions causing the complaints.

Investigations have also been made in the vicinity of the oil refinery at Braintree in response to numerous complaints relative to the escape of foul odors from that works.

Investigations have also been made relative to offensive odors arising from certain piggeries.

SHELLFISH.

Under the provisions of Chapter 370 of the Acts of 1926 this Division has continued the examinations of the shellfish-bearing areas along the coast. It has been found permissible to reduce slightly the bounds of the contaminated area in Plym-

outh Harbor, but otherwise the extent of the contaminated areas remains as determined by the Department as a result of its investigations in 1925 under the provisions of Chapter 300 of the Acts of 1925.

In accordance with Chapter 370, the Division has posted all of the contaminated areas, and representatives of the Division have assisted the Department of Conservation, Division of Fisheries and Game, in the preparation and trial of cases of violation of the shellfish acts.

The Division has also examined a great many requests for shellfish bed certificates of which 650, including the renewal of about 200 of the 1925 certificates, have been issued. It has been necessary to recall five of these certificates because of violation of the shellfish laws.

REPORT OF THE DIVISION OF WATER AND SEWAGE LABORATORIES.

H. W. CLARK, *Director.*

The work of this Division was greater by about 20 per cent during 1925 and 1926 than during previous years and it is becoming increasingly difficult with the present force to satisfactorily handle the great amount of analytical work required of these laboratories. During 1926 its accomplishment was only made possible by the employment of a larger number of temporary assistants than usual and by retaining two of them until the end of the year.

What can be called the strictly analytical work carried on by this Division at the Lawrence Experiment Station and in the State House laboratories has increased nearly threefold since the present Director was placed in charge thirty years ago and nearly 50 per cent during the last ten years. Notwithstanding this increase, the number of permanent employees in this Division has not been increased. That this greater amount of analytical work has been performed year after year has been due to (1) better laboratory equipment and systematizing of the work; (2) the employment of a greater number of temporary assistants each year; and (3) the carrying out of less research work. This latter curtailment is a serious loss to the Division and to the entire work of the Department upon water and sewage purification and many allied sanitary subjects.

The work of this Division is closely connected with that of the Division of Sanitary Engineering of the Department in which the regular number of employees in thirty years has been increased greatly, and the greater amount of engineering work has been the main cause of the great increase in the work of this Division. Occasionally during the past few years it has been necessary to leave work undone that has been forwarded to these laboratories by the engineers. This condition demands relief and either the laboratory force must be increased or less work expected of the Division.

In pursuance of the work of the Division the numbers of samples shown in the following table were analyzed chemically, bacterially and microscopically during 1926. The results of all the chemical analyses of public water supplies, rivers, sewage applied to and effluents from municipal sewage disposal areas, the work on which was done by this Division, are summarized in tables presented in the report of the Division of Sanitary Engineering.

The research work of the Division is necessary in order that a clearer understanding may be had of the many sanitary problems of the Department. During 1926 it included work upon the bacterial purification of water, upon the removal of color from water by filtration, studies of the storage of water and the absorption of color from different materials found upon the site of artificial reservoirs, and upon the hydrogen ion control of Imhoff tanks, this latter being a subject of great interest at the present time on account of the great use of such tanks throughout the country and conditions sometimes arising in connection with their operation. Tanks of this kind are in operation at Fitchburg, Worcester, Framingham and elsewhere in Massachusetts in connection with the disposal of municipal sewage. Further studies in regard to household septic tanks were made as this is a subject of particular interest to individuals or corporations whose homes, factories or other property can not be connected with municipal or other sewers, and studies of corrosion in connection with the use of brass and copper service pipes were also carried on. The activated sludge process of sewage disposal, originating at the Experiment Station in 1911 and 1912, and now adopted for the disposal of sewage by many large cities both in this country and abroad, was further experimented upon. Also, interesting studies were made of sand, trickling and contact filters kept in operation at the Station for many years, the value of the results from these filters increasing the greater their period of operation, and they are also of interest to engineers, chemists, students and others visiting the Station and interested in sewage disposal of communities in Massachusetts or elsewhere. During the year a

continuation was made of the study of iodine in water supplies. The shellfish work of the Department called for the examination of 436 samples and during the year further studies were made in regard to the condition of shellfish held in markets, shellfish undergoing the process of "soaking," etc. In connection with the determination of the condition and efficiency of municipal sewage filtration areas 1,062 samples were examined and in studies of sewage purification and improvements of methods 1,400 samples were examined. In addition various wastes from oil works and other industrial plants were studied and methods of disposal developed, and much work was done upon private and camp water supplies, the condition of swimming pools, the quality of ice, the pollution of rivers and the efficiency of municipal water purification plants. Bacterial studies of a large number of public water supplies to compare their bacterial condition with the bacterial standard of the U. S. Treasury Department were made and these studies, together with other work of the Division, necessitated the bacterial analysis of over four thousand samples. Much analytical work and field work on the special investigations of the Department such as the Essex County water supplies, Neponset Valley sewage disposal, etc., was done, and in this connection about seven hundred samples were analyzed. As usual the Station and the State House laboratories were visited by many engineers, chemists and others during the year, and classes of students from several engineering and medical schools and colleges were instructed.

The total number of samples examined by the Division during the year is shown in the following table:—

State House Laboratories.

Samples from public water supplies:	
Surface waters	2,645
Ground waters	1,182
Samples from domestic wells, ice supplies, etc.	510
Samples from rivers	1,211
Samples in connection with special water supply investigations (Essex County, Lawrence and Methuen)	398
Samples from sewage disposal works:	
Sewages	500
Effluents	562
Samples of wastes and effluents from factories	101
Samples of sea waters	31
Miscellaneous samples (partial analyses)	29
Microscopical examinations	2,765
Special examinations of water (including field work) for manganese, lead, alkalinity and acidity, dissolved oxygen, carbonic acid, copper, etc.	1,436

Lawrence Experiment Station.

Chemical examinations on account of investigations concerning the disposal of domestic sewage and factory wastes, filtration and other treatment of water supplies, swimming pools, and the investigation of the Merrimack and other rivers	2,243
Mechanical and chemical examinations of sands	147
Iodine determinations on public water supplies	14
Bacterial examinations of water supplies, rivers, sewage filter effluents, ice, swimming pools, etc.	3,321
Bacterial examinations in connection with methods of purification of sewage and water	1,081
Bacterial examinations of shellfish and sea waters	365

IODINE IN MASSACHUSETTS WATER SUPPLIES.

The examination of water supplies for iodine, started last year, was continued, determinations being made on ten additional supplies and repeated on two. The results follow:—

Iodine in Surface Waters.

SUPPLY.	1926.	Iodine (Parts per Billion).
Brookfield	March 12	2.46
Hadley	March 19	0.80
Huntington	March 29	0.53
Orange	April 15	0.20
Williamsburg	April 5	1.10

Iodine in Ground Waters.

Acton	April 8	0.20
Chelmsford	March 3	1.00
Deerfield	March 25	0.96
Duxbury	May 4	2.40
Easthampton	March 13	0.82
Provincetown	June 2	0.00
Webster	March 4	4.11

BACTERIAL QUALITY OF WATER SUPPLIES.

During the year about 3,700 bacterial analyses were made of the different water supplies, rivers, wells, springs, etc., of the State, and certain comparisons made of the bacterial quality of the public supplies with the U. S. Treasury standard. This standard as fixed in 1914 provides that not over one of five ten cubic centimeter portions examined shall show *B. coli* or a maximum of about 2 *B. coli* in one hundred cubic centimeters. The advisory committee on standards for drinking water supplied to the public by common carriers in interstate commerce in 1925 proposed a new requirement as to bacteriological quality, as follows:—

“(1) Of all the standard (10 c.c.) *portions* examined in accordance with the procedure specified below, not more than 10 per cent shall show the presence of organisms of the *B. Coli* group.

(2) Occasionally three or more of the five equal (10 c.c.) *portions* constituting a single standard *sample* may show the presence of *B. Coli*. This shall not be allowable if it occurs in more than —

(a) Five per cent of the standard samples when twenty (20) or more samples have been examined;

(b) One standard sample when less than twenty (20) samples have been examined.”

In this work about eighty public supplies including that of the Metropolitan district have been examined. From certain of these supplies, samples have been taken frequently during the year but from others only occasionally. Of the 207 samples of Metropolitan water (an impounded surface water) 90 per cent were of the required quality; of the Lawrence supply (a polluted river water filtered and then chlorinated) 702 examinations were made and 91 per cent passed the standard; of certain good ground water supplies, such as Duxbury, Hopkinton, Hyannis, Marion, Mattapoisett, Norton, Scituate, Shirley, Westwood, Weston and others, all the samples were of the required quality; of many surface water supplies all of the samples taken passed the standard, and all the samples from certain surface supplies of doubtful quality, such as Wakefield, but chlorinated on account of this, also passed the standard. Of the entire number of samples of public supplies examined 88 per cent were satisfactory according to this rigid test. It was apparent from this work, as would of course be expected, that the greater the number of samples collected the more definite was the amount of information obtained; that is, the supplies were definitely placed in one of two classes, — with those that would or those that would not pass the standard.

Bacterial Methods.

The standard methods of the American Public Health Association are used in the test for the presence of the coli-aerogenes group including “partial confirmation,” using litmus lactose agar, however, for confirmation instead of endo or eosin methylene blue as recommended. This procedure has been used here for many years and has given satisfactory results.

The statement in “Standard Methods of Water Analysis” that “our knowledge

is not sufficiently complete to warrant the adoption of any single test or group of tests," in differentiation of fecal from non-fecal members of the coli-aerogenes group is in accordance with the experience of these laboratories and for the present at least it is believed that any member of this group when found should be reported as *B. coli*, and in addition that streptococci when found on confirmation plates have the same significance as *B. coli*. It is impossible for this laboratory with the force engaged and when samples are coming in with great rapidity to carry out the complete confirmatory methods, and few laboratories do. These complete confirmatory tests are, however, carried out with several hundred samples each year and the results have shown year after year that 98 per cent of the samples partially confirmed are not changed by the complete tests.

Two kinds of plates are made on all samples, a litmus lactose agar plate with 24-hours' incubation at 37° C., and a nutrient agar plate incubated at 20° C. for four days, instead of two, as described in "Standard Methods." This had been the procedure of this laboratory for many years before there were any standard methods, and any change would involve more disadvantages than advantages. The litmus lactose agar plates are probably unnecessary as the same information is given by the four-day plates and the *B. coli* test. All media are made strictly in accordance with the standard methods and are adjusted very closely to a pH of 6.9.

The Significance of Red Colonies on 24-Hour Counts on Litmus Lactose Agar Plates.

All red colonies are counted as such without regard to their resemblance to typical *B. coli*. These plates are made from one cubic centimeter of water on a solid medium, while *B. coli* tests are made in one cubic centimeter and in five 10 cubic centimeter portions in a liquid medium which is much more favorable to the development of attenuated bacteria. Consequently *B. coli* are often found in the ten cubic centimeter portions, and even occasionally in the one cubic centimeter portions, although no red colonies are found on the 24-hour plates, but this is not usually the case. In good waters a very small proportion of the red colonies is *B. coli* while in water of poorer quality the proportion is much higher as has been thoroughly proved by the work of the laboratories.

SHELLFISH STUDIES.

"Soaking."

It is well known that salt water shellfish placed in contact with fresh water absorb water and plump up. The amount of this increase in volume under different conditions of temperature, time and volume of fresh water not being known the following experiments were made to obtain such data.

Fifteen lots of clams, quahaugs and oysters bought in the local markets were shucked and measurements of the proportion of meat to shell-water made. After shucking, the shell-water was drained off and moisture determinations on the meat started at once. Practically all the shell-water drained readily, but if the shucked samples were allowed to stand somewhat more liquid was given off slowly for a considerable period. Moisture was determined by drying in the water-bath oven to constant weight, this requiring from three to four days. Usually about two hundred cubic centimeters of the shucked sample measured in a cylinder were added to a definite volume of fresh water and allowed to stand for a definite period. The water was then drained off as before, the volume of shellfish measured, and moisture determinations started, the temperature, time of soaking, etc., being determined. The moisture determinations were made in duplicate and it was noted that the unwatered portions checked closely, while there was always more variation in the "soaked" portions; that is, different individual shellfish did not absorb the same proportion of water. The volume measurements were not as accurate as the moisture determinations because of the difficulty in preventing "open space" in the samples in the cylinders. The per cent of dry matter in unwatered oysters, that is, good oysters as bought in the shell, varied from 19.3 percent to 24.7 percent with an average of 21.0 percent; quahaugs varied from 19.5 percent to 21.4 percent with an average of 19.6 percent; clams varied from 19.5 percent to 24.0 percent with an average of 22.3 percent.

It was ascertained by numerous experiments that the volume of fresh water in contact with shellfish is the determining factor in the "plumping" although temperature and time are also factors. Slightly more water is absorbed at 70° F. than at 35° F., and while some water is absorbed in a few minutes the process goes on for quite a number of hours. The longest period of soaking in these experiments was twenty hours and it was found that soaking in running water for twenty hours gave practically the maximum "plumping." The highest volume increase in clams was 71.9 percent; in oysters, 19.9 percent; and in quahaugs, 36.6 percent. It was also determined by experiments that the amount of water absorbed by the neck or by the stomach or soft portion of shellfish was practically the same; also that from one to five minutes' washing of shucked shellfish in running fresh water may lower the dry matter from approximately 20 to 18 per cent, a decrease of 10 per cent. Experimental work also proved that the more salt the shell-water the greater the degree of "plumping" in contact with fresh water.

Relation between Shellfish, B. Coli Score and Sea Water.

An accompanying table gives a summary of the B. coli score of 1,037 samples of shellfish and of sea water from the locality from which these shellfish were obtained. These samples are arranged according to the score and further divided according to the number of B. coli in the corresponding sea water. Sea water samples are not necessarily representative of the prevailing conditions of the water over the shellfish beds on account of the effect of tides and winds. This is especially true of soft clams as the water samples are usually collected at low tide in shallow water and necessarily at some distance from where the clams are dug and an examination of the table indicates that it is apparently not feasible to set any B. coli standard for water over shellfish beds.

Table showing Relation between Shellfish B. Coli Score and Number of B. Coli per One Hundred Cubic Centimeters in Sea Waters from the Same Locality.

Soft Clams.

NUMBER OF SAMPLES.	Shellfish B. Coli Score.	PERCENTAGE OF SHELLFISH SAMPLES FOUND IN SEA WATER CONTAINING —			
		0 B. Coli in 100 cc.	10 B. Coli in 100 cc.	100 B. Coli in 100 cc.	1,000 B. Coli in 100 cc.
397	0 to 23	37.8	36.3	22.9	3.0
135	23 to 50	11.1	42.2	28.9	17.8
150	over 50	7.3	25.3	30.0	37.3

Quahaugs.

220	0 to 23	60.0	25.0	12.7	2.3
52	23 to 50	46.1	38.5	13.5	1.9
30	over 50	33.3	40.0	23.3	3.3

Oysters.

31	0 to 23	61.3	29.0	6.5	3.2
5	23 to 50	60.0	40.0	0.0	0.0
17	over 50	23.5	58.8	17.7	0.0

Studies of the Growth of B. Coli.

In connection with the 1925 shellfish work experiments showed that there was seldom an increase, and usually a decrease in the B. coli content of shell-water when stored for several days although other workers claimed to have noted large increases in number of B. coli in shellfish during storage and a number of experiments were made to determine whether or not there was any increase in B. coli in sewage and other media.

A domestic sewage before and after settling and a fresh sewage were kept at 20° C. and 37° C. and examined daily for B. coli. The number of B. coli tended to remain constant or to increase slightly in twenty-four hours and thenceforth to decrease rapidly to a small fraction of the original number, while the other bacteria present increased greatly for from one to three days and thereafter tended to slowly decrease but still remaining after four days at least as numerous as originally.

Similar results were obtained when sewages were placed in raw milk, sterilized

milk, and sterilized shell-water at 37° C. In no case where *B. coli* were present with other bacteria was there any appreciable increase in the number of *B. coli*. This is in line with much previous work of this Division.

STUDIES OF THE ORIGIN AND CHARACTERISTICS OF COLOR IN WATER AND COLOR-YIELDING SOILS AND OTHER MATERIALS.

One of the problems of the storage of water for domestic use is to so store it that it will improve in all respects rather than deteriorate. It is especially desirable from the consumers point of view to have a colorless water or at least one the color of which is not noticeable. In modern water works engineering there are two divergent views in regard to the reduction of color. One group of water experts advocate quite thorough preparation of a reservoir bottom by removal of all, or practically all, organic matters so that the water stored in such a reservoir can not absorb color from organic matter of various kinds and nature. This may mean the removal of all soil to a certain depth or only the muck, peat, etc., from swampy areas. In many instances swampy and peaty areas on reservoir sites are covered with from six to eight inches of sand instead of attempting removal of peat, muck, etc. The second group, or school of water works experts, pay little attention to such reservoir site preparation, placing dependence for color removal upon filtration with coagulants. The question of odor and organisms is also involved in this problem as a water stored in a reservoir, the bottom of which contains considerable organic matter of a certain kind, is more likely to be a good media for the growth of organisms with their characteristic odors than water stored in a cleaned reservoir. Such organisms and odor can, however, be removed by efficient filtration. Investigations and discussions of the color problem both from the point of view of storage and that of filtration have been made from time to time during the past thirty or more years by many workers along this line.

During the past thirty or more years this Department has made continuous studies in regard to the effect of the cleaning or preparation of reservoir sites upon the water stored in such reservoirs, these studies made year after year being based upon analytical work in the laboratories showing color, organisms, ammonia, etc., and many long-continued investigations in regard to the removal of color from water by various methods of filtration have been made and the results published. The reservoir sites have been of various classes, such as large deep reservoirs cleaned before flooding, large deep reservoirs uncleaned, and small reservoirs cleaned and uncleaned. These studies have shown in a general way that it is an advantage to clean such reservoir sites but many conflicting data have been obtained which have prevented a clear summary of the results, this confusion and the varying results being due probably to the lack of actual knowledge of the material, soil, mucks, etc., at the bottom of these reservoirs and their color-yielding and other properties. In order if possible to clear up certain confusion existing in these respects and to obtain other color data, studies were begun again at the Experiment Station early in the present year and a summary of these studies to date is as follows:—

These studies or experiments were designed to show (1) the actual amount of color yielded by certain soils, peats, etc., under different conditions, both aerobic and anaerobic; (2) the relation of this color to the organic matter in each material; (3) the rapidity with which each would yield color; (4) the difference in rapidity under different conditions such as passage of water through or simply standing in and over these materials; (5) the effect of depth of water over muck, peat, etc.; (6) the acidity or alkalinity factor by pH determinations; (7) the action of light, etc., and many other questions.

In the first place, materials from different locations and of the varying and characteristic nature of the materials often found at reservoir sites were collected for examination and experiment. These materials can be briefly described as follows:—

- No. 1. Largely dead grass roots just below the live roots in a meadow.
- No. 2. Black muck from a similar meadow containing few roots or peaty matter.
- No. 3. "Old" peat thrown out during the construction of a canal through an Essex County swamp.
- No. 4. Peat from the same locality but rather "newer" than No. 3.

No. 5. Peaty material from a salt marsh.

No. 6. "New" peat from near the surface of a woody swamp containing roots and coarse fibrous matter.

No. 7. Practically the same as No. 3.

No. 8. Practically the same as No. 4 but both Nos. 7 and 8 from different localities.

In order to show the color-yielding factor of each of these materials, weighed quantities of each were placed in two-quart glass percolators blackened to exclude sunlight. In the bottom of each percolator below the material studied was placed some mineral wool and sand to act as underdrains. The density of the different materials studied varied greatly but approximately eight inches in depth was placed in each percolator.

Analyses and the weights of each examined are shown in the following table in which the material number as described above and the percolator numbers correspond.

MATERIAL NUMBER.	PER CENT.		GRAMS.	
	Loss on Ignition.	Nitrogen.	Dry Peat in Percolators.	Organic Matter in Percolators.
1	65.6	1.81	189	124
2	35.7	1.24	464	166
3	89.4	2.45	160	143
4	91.6	2.55	159	146
5	26.4	0.61	485	128
6	82.6	2.77	174	144
7	90.2	2.00	143	129
8	83.3	2.57	129	107

Through these materials one hundred cubic centimeters of water were passed daily and the color of this water determined. A similar set of percolators similarly loaded with the various peats, etc., was also put into operation but in this set the percolators were kept full and the materials flooded while in the first set all, or practically all, of the water applied each day passed through and was drained from the material. These two experiments allowed the water to extract coloring and other organic matter under both aerobic and anaerobic conditions; that is, the effluents from the percolators drained daily contained 50 per cent or more of saturation with oxygen while no dissolved oxygen was ever found in the effluents from the percolators the material in which was kept flooded. The colors of the effluents of all were read daily and the iron and hydrogen ion concentration determined weekly. Average samples were also collected for complete analysis. A following table presents the record of the average daily color readings and the average of the samples collected for complete analysis, the first covering a period of three months and the second of two months. In this table the percolator numbers, 1, 2, etc., represent the percolators drained daily, while 1F and 2F, etc., represent the percolators in which the material was kept flooded, and it will be noticed that the colors obtained under the anaerobic conditions existing in the full percolators averaged very much higher than the colors of the effluents of the percolators through which the water passed more quickly and the material was always under aerobic conditions.

SAMPLE FROM PERCOLATOR NUMBER.	COLOR.			
	Average Daily.	First Average Sample (3 Months).	Average Daily.	Second Average Sample (2 months).
1	0.64	0.63	0.46	0.47
1F	4.05	6.20	2.69	4.70
2	0.16	0.25	0.12	0.14
2F	2.78	3.50	3.46	4.74
3	2.88	2.60	2.44	2.20
3F	6.71	6.00	4.50	4.70
4	4.83	4.70	3.03	3.70
4F	11.94	12.00	7.95	9.50
5	0.45	0.45	0.36	0.30
5F	12.66	9.00	7.23	6.00
6	0.41	0.43	0.50	0.50
6F	3.12	3.00	1.73	2.35
7F	3.79	4.30	2.71	2.65
8F	7.11	7.40	3.48	2.40

The time which the water remained in contact with each material in the flooded percolators was determined and found to vary from two and one-half days in percolator 2F to nine days in percolator 4F as shown in the following table. In the drained percolators, moreover, owing to the nature of each material and the volume of water held in its open space, the effluent collected each day was quite largely water which had been for at least twenty-four hours held in contact with these color-yielding materials.

PERCOLATOR NUMBER.										Number of Days Water was retained in Percolator.	
1F	.	.	.	.	.	.	.	.	.	7	
2F	.	.	.	.	.	.	.	.	.	2½	
3F	.	.	.	.	.	.	.	.	.	7	
4F	.	.	.	.	.	.	.	.	.	9	
5F	.	.	.	.	.	.	.	.	.	5	
6F	.	.	.	.	.	.	.	.	.	5	
7F	.	.	.	.	.	.	.	.	.	7	
8F	.	.	.	.	.	.	.	.	.	5	

The results of the collection and storage of samples from the flooded percolators seemed to show that while the greatest amount of color was yielded under anaërobic conditions yet this color could be increased by oxidation. This was shown to be true by treating equal weights of color-yielding material in gallon bottles, aerated and unaërated, and, speaking broadly, the color increase under oxidizing conditions was twice that under unaërated conditions. It was shown clearly, moreover, by such experiments that oxidation of anaërobic extracts from fresh or freshly decaying organic matter develops more color than from such extracts from old organic matter such as peat although the total amount of organic matter in the two materials be about equal.

The rapidity with which color is extracted from different materials varies greatly, and a following table shows approximately the length of time required for the color from each material experimented with to reach its maximum, and the length of time that the maximum continued before the extract with distilled water began to decrease in color. It is probable that treating the different materials in these percolators as has been described will extract color slowly and that even after several months (with some of the materials perhaps after several years) coloring matter can still be extracted when adding only one hundred cubic centimeters of distilled water daily. The pH determinations of the effluents from the percolators are perhaps only of interest to compare the extract from the different kinds of peat experimented with. This is on account of the fact that the pH of the applied distilled water varied considerably and this variation was not noticed until the experiments had been continued for a considerable period. Pure distilled water free from CO₂ should have a pH of 7.0 but generally distilled water contains some free CO₂ and in the absence of a buffering substance such as occurs in natural waters a small amount of this CO₂ has a great influence on the pH of the distilled water. The pH of the effluents of the flooded percolators was lower except in one instance than the effluents of the drained percolators, this being so as the effluents of the full percolators always contained more coloring and other organic matter than the effluents of the drained percolators and the coloring matter from peat is of an acid nature. As was to be expected the amount of iron in the effluents of the full percolators operated under anaërobic conditions was high but not high enough to be an important factor in the color of these effluents. A following table presents the average analyses from both sets of percolators. In one instance the free ammonia is high on account of the decaying grass and roots, and an unexpected result was the presence of nitrates as high in one instance as .48 part in 100,000. These experiments had been continued five months up to November 30, 1926.

Average Chemical Analyses.

Effluents from Percolators Filled with Peat.

[Parts in 100,000.]

Percolator Number.	RESIDUE ON EVAPO- RATION.				AMMONIA.			Chlorine.	NITROGEN AS —		Oxygen consumed.	Iron.	Alkalinity.	Hydrogen-ion Concentration.	Soap Hardness.
	Color.	Total.	Loss on Ignition.	Free.	ALBUMINOID.		Nitrate.		Nitrite.						
					Total.	In Sol.									
1	.57	12.8	4.9	.0049	.0166	.0133	.29	.358	.0014	.71	.0332	0.7	6.4	3.9	
1F	5.60	21.5	13.8	.5523	.1352	.0894	.35	.098	.0000	3.46	2.4945	4.8	6.1	5.6	
2	.21	8.2	2.6	.0034	.0110	.0087	.18	.035	.0032	.22	.0234	2.3	6.8	3.0	
2F	4.00	25.0	9.3	.3690	.0800	.0629	.94	.044	.0004	2.22	2.1128	8.1	6.4	5.9	
3	2.44	14.0	7.2	.0097	.0430	.0283	.16	.290	.0052	1.94	.0669	2.2	6.6	4.5	
3F	5.48	17.3	9.4	.1442	.1102	.0859	.27	.030	.0000	4.45	.4765	4.5	6.4	6.2	
4	4.30	19.2	11.1	.0221	.0842	.0634	.50	.349	.0010	3.51	.1226	1.0	6.5	6.5	
4F	11.00	22.9	14.6	.1795	.1440	.1252	.27	.010	.0000	7.40	.4535	4.7	6.3	6.2	
5	.39	202.3	20.4	.0398	.0277	.0236	94.80	.174	.0041	.49	.0752	3.0	6.5	9.8	
5F	7.80	234.9	37.4	.1923	.2460	.1792	115.80	.012	.0000	6.10	1.9350	16.0	6.7	3.8	
6	.45	15.9	7.2	.0000	.0223	.0156	.57	.481	.0034	.57	.0226	2.3	6.8	5.9	
6F	2.74	15.5	8.2	.1636	.0593	.0473	1.93	.023	.0004	1.93	.4512	4.6	6.4	5.4	
7F	3.64	13.8	7.1	.0543	.0481	.0416	.29	.033	.0006	3.12	.2881	2.6	6.3	4.0	
8F	5.40	16.7	9.6	.1007	.1006	.0712	.20	.010	.0000	3.34	.4847	2.5	6.5	5.0	

COLOR STUDIES WITH DEEP TANKS.

In addition to the percolator experiments, investigations were begun early in the year with deep tanks in which 2½ feet in depth of peat was placed and the remainder of the tank filled with water. For this purpose three tanks, 20 feet deep and 20 inches in diameter, were used. In Tank No. 550 was placed 47 pounds dry weight of peat No. 6 which when treated in a flooded percolator gave an average color of 3.12; in Tank No. 551 was placed 50 pounds of peat No. 3 which in the flooded percolator gave an average color of 2.88; and in Tank No. 552 was placed 39 pounds of dry peat No. 4 which in the flooded percolator gave an average color of 11.94. Six inches of clean sand was placed over the peat in this last tank. Early in July these tanks were carefully filled with water and the surfaces of the tanks have always been exposed to the sun and air.

These experiments were intended to duplicate as far as possible under experimental conditions sections of deep reservoirs with peaty bottoms. Until September 7 one gallon of Merrimack River water was added daily to each tank through a pipe reaching to just above the surface of the peat and color readings were made of the applied water and the water overflowing the top of the tank. This volume of water added daily would theoretically allow a storage period of applied water of about 350 days. As during the first two months there was no appreciable increase of color in the water in these tanks, after September 7 the practice of adding water containing dissolved oxygen to the bottom of the tanks daily was discontinued and they were allowed to stand filled for three weeks in order that if possible anaërobic conditions might occur in and above the peat. At the end of this period, however, dissolved oxygen was still present in the bottom water, and five gallons of water rich in organic matter and containing no dissolved oxygen was added directly above the peat. This water, however, absorbed oxygen from the layers above and the color of the effluent did not increase. It was then thought that color might have been extracted from the peat but not diffused in the water above, hence on November 11 a pipe was placed in the tank reaching to within an inch of the bottom and water equivalent to 1 foot in depth forced in under pressure. Considerable gas was given off from the peat and on November 15 this treatment was repeated. Following this the color in the two feet in depth of water above the peat increased from .46 to 1.35. The lack of color yield from the peat during the five months to the end of the year was unexpected although the conditions were so different from those under which the same material in the percolators were tested that only a fraction of the percolator yield of color was expected. If, however, the peats in the bottom of these tanks had yielded color as the same materials did in the percolators the colors of the waters in these tanks would have been 4.04, 7.66 and

14.5, respectively. The pH of the water in all three color tanks, Nos. 550, 551 and 552, at all depths was 7.0. The temperatures of the water in the tanks were as shown in the table:—

MONTH.	TEMPERATURE (DEGREES F.).					
	TOP OF TANK.			BOTTOM OF TANK.		
	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
July	70	81	61	66	73	60
August	69	77	60	66	72	60
September	63	71	54	60	68	50
October	58	71	50	56	68	49
4 months	65	81	50	62	73	49

Extraction of Color from Peat by Sodium Hydroxide.

It has been the practice at the Experiment Station for the past ten years to remove the stored coloring matter in the water filters of sand impregnated with ferric hydroxide by treatment of the sand with a dilute sodium hydroxide solution and it was thought that the same process applied to soil, peat, muck, etc., might give useful information in regard to the total amount of coloring matter present. To test this, five-gram portions of the dry peats, etc., used in the percolator experiments were extracted with successive portions of a hot .5 per cent solution of sodium hydroxide until the solution was practically colorless and the extracts were made up to one gallon and the total color determined. These color determinations are shown in the following table. For comparison, the average colors of the "flooded" percolator effluents, reduced to the same weight of peat and volume of water, are also given.

PEAT NUMBER.	COLOR EXTRACTED BY NaOH CALCULATED ON WEIGHT OF —		COLOR EXTRACTED IN FULL PERCOLATORS CALCULATED ON WEIGHT OF —	
	Peat.	Organic Matter Only.	Peat.	Organic Matter Only.
1	21.0	32.0	0.50	0.77
2	22.0	61.5	0.09	0.26
3	60.0	67.0	0.74	0.83
4	74.0	80.7	1.19	1.29
5	15.0	56.8	0.28	1.05
6	43.0	52.0	0.27	0.33
7	100.0	110.7	0.44	0.48
8	50.0	62.8	0.72	0.87

These results show, as might be expected, that the organic matter of different types of peat does not yield the same amount of coloring matter either to NaOH or to anaërobic treatment with water but peats Nos. 1, 5 and 6 which are apparently of most recent formation gave the least color to the NaOH treatment.

The value of this method as an indication of the potential coloring matter of soils, peats, etc., can only be determined after a long period of operation of the percolators and comparison of extraction results.

FILTRATION OF WATER.

Color Removal Filters.

During 1926 ten sand filters loaded or impregnated with ferric or aluminum hydroxide have been operated. Filters of this type originating at the Lawrence Experiment Station and fully described in previous reports, have been operated continuously since 1917. All of these filters have given the usual satisfactory results during the year and data in regard to four that are typical of all are given in the following tables.

Constructional Data on Color Removal Filters.

FILTER NO.	Date Started.	Tons Ferric or Aluminum Sulphate per Acre.	Tons Ferric Hydroxide or Aluminum Hydroxide per Acre.	Depth of Sand (Feet).	Effective Size of Sand (mm.).
488	May 14, 1917	64.5	34.5	4.0	.25
494	June 7, 1918	80.5 ¹	20.2	4.0	.25
496	Sept. 19, 1918	27.0	14.4	4.0	.25
535	Nov. 24, 1923	80.4	43.0	4.0	.25

¹ Aluminum sulphate.

Data on Operation of Color Removal Filters.

FILTER No.	AVERAGE SINCE START OF FILTERS.					Average Color, 1926.
	GRAINS PER GALLON OF WATER FILTERED.		Number of Times Treated.	Average Number of Days between Treatments.	Average Color.	
	Caustic Soda.	Ferric or Aluminum Sulphate.				
Canal	—	—	—	—	.39	.37
488	.45	.06	54	53	.14	.14
494	.43	.09	50	52	.16	.14
496	.14	.03	13	194	.08	.07
535	.43	.36	10	63 ¹	.11	.12

¹ Calculated to five million rate.

Average Chemical Analyses.

[Parts in 100,000.]

FILTER NUMBER.	Color.	AMMONIA.			NITROGEN AS —		Oxygen con- sumed.	Iron.	Alka- linity.	Carbon Dioxide.
		Free.	ALBUMINOID.		AS —					
			Total.	In Sol.	Nitrates.	Nitrites.				
Canal	.37	.0112	.0168	.0115	.019	.0005	.50	.0700	0.8	0.3
488	.14	.0101	.0089	—	.022	.0008	.26	.0470	1.1	0.3
494	.14	.0114	.0086	—	.023	.0006	.29	.0530	1.1	0.3
496	.07	.0025	.0054	—	.026	.0001	.16	.0310	1.2	0.3
535	.12	.0055	.0091	—	.027	.0000	.27	.0337	1.7	0.6

Average Bacterial Analyses.

FILTER NUMBER.	BACTERIA PER CUBIC CENTIMETER.				PER CENT OF BACTERIA REMOVED.				B. Coli in 100 cc.
	4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.				
		Total.	Red.		Total.	Red.			
Canal	2,200	290	66	—	—	—	4,300		
488	150	23	4	93.4	92.0	93.9	46		
494	150	14	3	93.4	95.2	95.5	78		
496	47	5	1	97.8	98.3	98.5	8		
535	180	14	3	91.8	94.5	95.5	54		

MECHANICAL FILTRATION OF WATER.

During the year Filter No. 520, a complete small filter of the mechanical type, was operated at the comparatively low rate of 61 million gallons per acre daily. The physical characteristics of the effluent were satisfactory but its B. coli content was greater than the U. S. Treasury standard of two in one hundred cubic centimeters in about 30 per cent of all samples collected, averaging five for the year. This was, however, a reduction of the B. coli content of the river water applied of 99.88 per cent. The effluent, moreover, did not satisfy the proposed modification of the U. S. Treasury standard which calls for an average of not more than one B. coli in one hundred cubic centimeters but allows 5 per cent of the samples tested to contain six B. coli in one hundred cubic centimeters. In practically every sample tested where the present limit of two B. coli in one hundred cubic centimeters was exceeded, more than six B. coli in one hundred cubic centimeters were found. These results confirm previous conclusions that the highly polluted Merrimack river water can not be satisfactorily purified by mechanical filtration alone.

Average Bacterial Analyses.

Merrimack River Water applied to Mechanical Filter No. 520.

BACTERIA PER CUBIC CENTIMETER.				PER CENT OF BACTERIA REMOVED.				B. Coli in 100 cc.
4 Days 20° C.	24 HRS. — 37° C.		4 Days. 20° C.	24 HRS. — 37° C.				
	Total.	Red.		Total.	Red.			
2,200	290	66	—	—	—	4,300		

Water after Coagulation and Sedimentation applied to Mechanical Filter No. 520.

520	39	4	—	—	—	77
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Effluent from Mechanical Filter No. 520.

56	1	0	97.5	99.6	100.	5
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LAWRENCE CITY FILTERS.

As usual this report presents here the data in regard to the operation during the past year of the sand filters of the city of Lawrence. This filter plant is the largest in the State and treats one of the most polluted waters used as the source of a public water supply in this country. The supply has been taken from the Merrimack River since 1875. Since 1893 the water has been filtered through slow sand filters and for the past nine years, chlorine has been added as an additional measure of safety. Two filters are in use, the older, 2.2 acres in area, is divided into three sections, one of which is covered. The second is .75 of an acre in area and is also covered. Another covered unit of .75 of an acre was completed early in 1926 but had not at the end of the year been in satisfactory operation and its effluent has been wasted.

The average volume of water filtered daily during 1926 was 4,961,125 gallons. Liquid chlorine was applied at the pump-well at the average rate of 1.02 parts per million, and the bacterial quality of both the filtered and chlorinated water was better than during previous years. The results of analyses follow:—

Average Bacterial Analyses.

Merrimack River. — Intake of the Lawrence City Filters.

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 cc.
4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		.001 cc.	.01 cc.	0.1 cc.	1.0 cc.	10 cc.	
	Total.	Red.		Total.	Red.						
5,700	530	103	—	—	—	2	46	96	100	100	6,700
<i>Effluent from Lawrence City Filter (Old Filter).</i>											
50	5	1	99.1	99.1	99	—	—	0	15	44	19
<i>Effluent from Lawrence City Filter (New Filter).</i>											
68	4	0	98.8	99.2	100	—	—	0	8	40	11
<i>Mixed Effluents as pumped to the Distributing Reservoir.</i>											
28	3	0	99.5	99.4	100	—	—	0	0	7	1
<i>Water from the Outlet of the Distributing Reservoir after Chlorine Treatment.</i>											
52	6	0	99.1	98.9	100	—	—	0	0	19	2
<i>Water from a Tap at Lawrence City Hall.</i>											
33	3	0	99.4	99.4	100	—	—	0	0	6	1
<i>Water from a Tap at the Lawrence Experiment Station.</i>											
52	5	0	99.1	99.1	100	—	—	0	0	8	1

Average Chemical Analyses.

Merrimack River. — Intake of the Lawrence City Filters.

[Parts in 100,000.]

Temperature (Degrees F.).	APPEARANCE.		AMMONIA.			Chlorine.	NITROGEN AS—		Oxygen consumed.	Iron.	Soap Hardness.
	Turbidity.	Color.	Free.	ALBUMINOID.			Nitrates.	Nitrites.			
				Total.	In Sol.						
48	0.1	.36	.0164	.0201	.0134	.47	.019	.0007	.54	.0657	1.4
Effluent from Lawrence City Filter (Old Filter).											
50	0.0	.34	.0124	.0092	—	.60	.033	.0001	.36	.1337	1.6
Effluent from Lawrence City Filter (New Filter).											
50	0.0	.31	.0096	.0094	—	.58	.031	.0006	.38	.0750	1.6
Water from the Outlet of the Distributing Reservoir.											
50	0.0	.35	.0081	.0091	—	.63	.030	.0002	.38	.1160	1.5
Water from a Tap at Lawrence City Hall.											
52	0.0	.37	.0059	.0085	—	.63	.034	.0001	.36	.1252	1.5
Water from a Tap at the Lawrence Experiment Station.											
52	0.0	.35	.0043	.0076	—	.62	.035	.0001	.36	.1117	1.5

TREATMENT OF SEWAGE.

During the year groups of filters, tanks, etc., were in operation for research work in regard to sewage purification and to illustrate the different methods used. Sand, contact and trickling filters, and Imhoff, septic and activated sludge tanks were all in operation, their results studied and efforts made to add to and improve our knowledge of each process.

Character of the Sewage used for Investigations upon Sewage Purification at the Lawrence Experiment Station.

The following tables present the average analyses of sewage used during the year. "Regular sewage" is the average of the sewage as pumped to the Station; "settled sewage" is the sewage applied to all tanks and filters except Filters Nos. 1, 4 and 9A, and is regular sewage after passing through Imhoff tanks and receiving a slight additional settling in a large tank supplying the various filters.

Average Analyses.

Regular Sewage.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
3.90	.73	.47	1.28	.82	9.8	5.63	1,800,000
Settled Sewage.							
3.93	.61	.39	1.04	.69	8.7	4.47	1,880,000
Sewage applied to Filters Nos. 1, 4 and 9A.							
4.21	.60	.41	1.02	.74	9.6	3.91	1,800,000

Average Solids.

Regular Sewage.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
67.2	32.7	34.5	48.2	20.3	27.9	19.0	12.4	6.6
<i>Settled Sewage.</i>								
51.4	22.9	28.5	40.9	16.9	24.0	10.5	6.0	4.5
<i>Sewage applied to Filters Nos. 1, 4 and 9A.</i>								
56.5	27.5	29.0	47.1	21.4	25.7	9.4	6.1	3.3

IMHOFF TANKS.

During 1926 six two-story tanks of the Imhoff type were put into operation at the Station. Two of these tanks, Nos. 544 and 545, are constructed of concrete, 20 feet deep, and are practically of the same capacity. The settling compartment in No. 544, however, has a capacity of 275 gallons and the digestion chamber 955 gallons while in No. 545 the conditions are reversed, the settling compartment holding 715 gallons and the digestion chamber 357 gallons. They were constructed in this way to determine if when treating the same sewage the relative capacity of these divisions had any influence upon digestion without foaming, etc. Started March 1 an average volume of 1,330 gallons of sewage has been passed through each tank daily. This sewage receives an average theoretical retention of 1.5 hours in Tank No. 544 and of 3.75 hours in Tank No. 545. In each tank settleable solids have been removed from the sewage and accumulated in the digestion chambers at the rate of 800 pounds of dry matter per million gallons of sewage treated. In each tank fermentation began about six weeks after being put into operation and has been moderately active since that date. While a considerable scum has arisen in the gas vents and there has also been from time to time accumulation of fatty

matters on the surface of the settling chambers yet no foaming has occurred. After two and one-half months the sludge began to improve rapidly and after three months' operation of the tanks was in good, stable, inodorous condition and contained about 12 per cent of dry matter. The average temperature of the sewage applied was 60° F. and the temperature at the top of the tank 65° F. and at the bottom, 57° F. So far there has been little difference in the work of these two tanks.

The pH of the applied sewage has been consistently 6.8 as has the sludge in the digestion chamber of each tank, the lowest pH found being 6.5. The average alkalinity to methyl-orange of the liquid portion of the sludge from Tank No. 544 has been 107 parts and from Tank No. 545, 116 parts. It is generally considered that a pH below 7 indicates acidity, that is, an excess of hydrogen ions over hydroxyl ions but the fact that the pH of the sludges from these tanks was consistently 6.8 does not necessarily indicate that acid fermentation was taking place. All the alkalinity of the effluents was bicarbonate and there were 10 or more parts of free CO₂ present and only an organic acid weaker than carbonic acid could be present as it would at once be neutralized by the bicarbonates in the sludge. It is undoubtedly true in these particular experiments that it was the free CO₂ that caused a pH below 7. Driving the CO₂ from this liquid causes it to have a pH of 7.1. The pH of a substance like these sludges is the net result of the acid properties of the free CO₂ and the basic properties of the bicarbonates. For instance, 10 parts of free CO₂ in distilled water would cause this water to have a pH well below 6 and 100 more parts bicarbonate would give a pH well over 7.

On July 3 four smaller two-story Imhoff tanks were started. These tanks were of galvanized iron, 14 feet deep and 20 inches in diameter, and with the digestion and settling compartments of equal size. Each tank was seeded at the beginning with 2½ gallons of ripe sludge from Imhoff tanks Nos. 544 and 545 in order that digestion would be encouraged to start immediately. To each of these tanks 63 gallons of sewage are passed daily and in addition sludge is applied daily to three of them at the rate of one gallon and to the fourth, No. 549, at the rate of two gallons daily. For several months all of these tanks had a pH of 6.8 and during this period no fermentation occurred and the sludge was exceedingly offensive. On October 14 calcium oxide and sodium hydroxide were added in small portions to Tank No. 547 until the pH of the sludge compartment was 7.4. In the same way sulphuric acid was added to Tank No. 548 until the pH was about 6. Increasing the pH of No. 547 to 7.4 has not, however, as yet caused fermentation or digestion and neither has this occurred in either of the remaining tanks. At the present time the application of sludge has been discontinued in order to give a period of ripening of the sludge within them.

Operation of Household Septic Tanks.

The purification of municipal sewage by so-called septic tanks began to be studied quite thoroughly nearly thirty years ago and many large tanks of this description were put in operation by different cities and towns in this country and abroad, especially in England. For municipal purposes the method has largely gone out of use as newer and more effective methods for the treatment and purification of sewage have been discovered and used. There seems to be a place, however, for this process in the disposal of small volumes of sewage from houses, factories, hotels, etc., and tanks treating such sewage appear to be efficient in most instances. In order to have data of our own on this subject covering the operation of such tanks through a series of years two small septic tanks were put in operation in June, 1920, and have been continued up to date. These tanks are of concrete construction and are designated as Tanks Nos. 507 and 508. The first is 4 feet long, 2 feet wide and 40 inches deep, with a sloping bottom and a capacity of 185 gallons; the second is constructed as the first but consists of two compartments and has a total capacity of 370 gallons. The sewage enters each tank through trapped inlets and discharges through a pipe reaching 15 inches below the surface of the sewage in the tank. A baffle is placed one-third of the distance from the inlet to the outlet and reaches to within eight inches of the surface of the sewage and within ten inches of the bottom of the tank. A trapped outlet is provided for the escape of gas, and air is carefully excluded. The first tank receives fresh household sewage and the

second Lawrence city sewage, — a stale sewage. Both tanks are so operated that theoretically the sewage is held within each for two days. During their entire period of operation the effluents from both tanks have been remarkably clear, this being due not only to the deposition within them of a large part of the coarse suspended matter but also by the coagulation of the colloidal matter which when present causes effluents to appear cloudy and milky.

The tanks were opened April 20, 1926, for examination and sludge measurements. Tank No. 507 contained 2 feet of sludge and the two compartments of No. 508 contained 2 feet and 15 inches, respectively, compared with about 13 inches in each tank when opened in 1924. The sludge in both tanks was black and inoffensive.

Since these tanks were started in 1920, up to April, 1926, 69 per cent of the suspended organic matter deposited in Tank No. 507 has been destroyed and in Tank No. 508, 68 per cent. This is a somewhat lower proportion than was destroyed in the first four years. There has been little fermentation and comparatively little odor given off from these tanks during the year. The sludge from Tank No. 507 contained 2.51 per cent of nitrogen, 8.9 per cent of fats and 43.9 per cent loss on ignition. The sludge from Tank No. 508 contained 2.31 per cent nitrogen, 10.7 per cent of fats and 41.6 per cent loss on ignition. It is apparent from the sludge measurement that after six years of operation sludge is accumulating to such an extent that it will probably need removal in 1927.

Average Analyses.

Fresh Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
5.03	1.07	.61	1.89	1.07	8.7	6.36	2,100,000
Effluent from Closed Septic Tank No. 507.							
4.99	.48	.30	.83	.51	7.8	3.59	1,170,000
Regular Sewage applied to Closed Septic Tank No. 508.							
4.17	.73	.42	1.30	.72	8.5	5.07	2,350,000
Effluent from Closed Septic Tank No. 508.							
3.90	.30	.19	.54	.35	7.8	2.70	1,300,000

Average Solids.

Fresh Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
72.0	39.4	32.6	48.7	23.0	25.7	23.3	16.4	6.9
<i>Effluent from Closed Septic Tank No. 507.</i>								
49.0	22.3	26.7	41.7	17.2	24.5	7.3	5.1	2.2
<i>Regular Sewage applied to Closed Septic Tank No. 508.</i>								
66.4	33.3	33.1	42.2	18.3	23.9	24.2	15.0	9.2
<i>Effluent from Closed Septic Tank No. 508.</i>								
44.0	17.8	26.2	38.6	14.4	24.2	5.4	3.4	2.0

PURIFICATION OF SEWAGE BY AERATION.

Activated Sludge Process.

Experiments on the aëration of sewage have been carried on at the Experiment Station continuously since 1912 and the results have been published in the annual reports of the Department. Activated sludge Tank No. 485, started in 1917, is

still in operation. It consists of three compartments 75 inches deep, each holding 230 gallons. The overflow from the last passes through two settling tanks of 600 and 160 gallons capacity, allowing about seven hours sedimentation, and the settled sludge is pumped back to the first compartment practically every hour. The tank is operated at the rate of 7,500,000 gallons per acre daily and this volume could undoubtedly be doubled in a tank of twice the depth of Tank No. 485 and with as good results and with the use of no greater volume of air. As is the usual custom about 20 per cent by volume of sludge is retained in Tank No. 485, the surplus being pumped to waste from time to time. During the year this surplus was at the rate of 900 pounds dry sludge per million gallons of sewage treated. The sewage applied to this tank was first passed through Imhoff tanks Nos. 544 and 545 and the main supply tank of the Station. By this preliminary treatment 873 pounds of dry sludge per million gallons were removed or a total removal of sludge by the complete process of 1,773 pounds per million gallons. Filtros plates are used as air diffusers. The activated sludge examined during the year contained 6.25 per cent of nitrogen and 6.4 per cent of fats. The effluent has been clear and stable.

Average Analyses.

Sewage applied to Activated Sludge Tank No. 485.

[Parts in 100,000.]

APPEARANCE.		AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	NITROGEN AS —		Oxygen consumed.	Bacteria per Cubic Centimeter.
Turbidity.	Color.	Free.	ALBUMINOID.		Total.	In Sol.		Nitrates.	Nitrites.		
			Total.	In Sol.							
—	—	4.13	.67	.41	1.16	.73	9.5	—	—	4.22	1,870,000

Effluent from Activated Sludge Tank No. 485.

0.5	.63	2.38	.16	.13	0.28	.22	9.2	.34	.0205	1.11	440,000
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SAND, TRICKLING AND CONTACT FILTERS.

During the year three sand filters, eight trickling filters and one contact filter have been in operation. Two of the sand filters have now been receiving sewage for thirty-nine years and one for thirty-six years. One trickling filter has been in operation twenty-seven years (No. 135) and the remainder for approximately thirteen years, and the contact filter for twenty-five years. Statements in regard to the operation of these filters have been given in many reports. They are now operated to show factors in regard to period of operation with minimum attention, rates of operation that can be continued year after year without clogging, comparative rates of each class, comparative purification and in the case of the trickling filters, results from different depths of filtering material. The average analyses for the year follow: —

Average Analyses.

Effluent from Filter No. 1.

[Parts in 100,000.]

TEMPERATURE (DEGREES F.).		AMMONIA.		Chlorine.	NITROGEN AS —		Oxygen consumed.	Alkalinity.	Bacteria per Cubic Centimeter.
Applied.	Effluent.	Free.	Albuminoid.		Nitrates.	Nitrites.			
53	52	.6900	.0700	9.2	3.08	.0010	.55	—2.2	42,000
<i>Effluent from Filter No. 4.</i>									
53	53	.0058	.0148	8.5	2.31	.0001	.28	—1.5	580
<i>Effluent from Filter No. 9A.</i>									
53	53	.3737	.0536	7.6	2.30	.0006	.48	—1.5	14,500

Albuminoid Ammonia in Sand from Filters Nos. 1, 4 and 9A.

[Parts in 100,000.]

DEPTH (INCHES).	FILTER NO. 1.			FILTER NO. 4.	FILTER NO. 9A.		
	1920.	1925.	1926.	1926.	1920.	1925.	1926.
Average first 12	112.2	83.0	86.4	124.5	92.3 ¹	42.2	56.2
18	41.1	68.2	37.0	38.3	8.5	22.4	33.0
24	8.7	20.8	24.6	14.0	9.2	8.7	12.3
36	7.0	11.3	10.1	13.2	4.4	5.9	7.6
48	5.3	11.4	4.2	13.7	3.9	5.6	5.6
60	3.8	6.1	5.1	10.9	3.9	4.2	6.8

¹ Nov. 26, 1920, one foot removed and washed. Replaced May 3, 1921. Albuminoid ammonia after washing 53.4.

*Average Analyses.¹**Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.*

[Parts in 100,000.]

FILTER NUMBER.	Quantity Applied.— Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen Consumed.	Bacteria per Cubic Centimeter.
		Free.	ALBUMINOID.				Nitrates.	Nitrites.		
			Total.	In Sol.						
135	1,395,000	1.71	.38	.24	.64	8.2	1.64	.0225	2.64	255,000
452	753,000	2.34	.45	.29	.78	8.2	1.02	.1197	3.02	685,000
453	3,680,000	2.62	.45	.29	.78	8.1	.46	.1109	2.84	700,000
454	1,700,000	2.27	.39	.26	.66	7.9	1.14	.0308	2.58	845,000
455	2,550,000	1.74	.34	.21	.60	8.0	1.45	.0282	2.43	565,000
473	914,000	2.42	.40	.27	.72	8.0	.78	.0616	2.78	645,000
474	1,570,000	2.46	.38	.25	.68	7.9	.60	.0754	2.65	800,000
475	2,500,000	2.07	.40	.25	.71	8.0	1.46	.0325	2.70	600,000

¹ Average for two years, 1925 and 1926.*Average Solids.¹**Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.*

[Parts in 100,000.]

FILTER NUMBER.	UNFILTERED.			FILTERED.			IN SUSPENSION.		
	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
135	52.8	23.8	29.0	45.0	19.8	25.2	7.8	4.0	3.8
452	53.8	22.4	31.4	42.2	16.0	26.2	11.6	6.4	5.2
453	48.7	20.4	28.3	37.6	14.4	23.2	11.1	6.0	5.1
454	48.5	20.5	28.0	39.3	15.4	23.9	9.2	5.1	4.1
455	53.1	22.5	30.6	41.7	16.8	24.9	11.4	5.7	5.7
473	47.9	20.1	27.8	38.1	15.9	22.2	9.8	4.2	5.6
474	45.0	18.2	26.8	37.2	14.5	22.7	7.8	3.7	4.1
475	53.6	23.7	29.9	44.2	19.6	24.6	9.4	4.1	5.3

¹ Average for two years, 1925 and 1926.*Average Analyses.¹**Effluent from Contact Filter No. 175.*

[Parts in 100,000.]

Quantity Applied.— Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen con- sumed.	Bacteria per Cubic Cen- ti- meter.
	Free.	ALBUMINOID.				Nitrates.	Nitrites.		
		Total.	In Sol.						
267,000	1.09	.22	.15	.38	8.0	.93	.0401	1.70	1,025,000

¹ Average for two years, 1925 and 1926.

Average Solids.¹
Effluent from Contact Filter No. 175.
 [Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
40.1	14.7	25.4	37.1	13.3	23.8	3.0	1.4	1.6

¹ Average for two years, 1925 and 1926.

INDUSTRIAL WASTES.

During the year a number of investigations have had to be made in regard to the treatment and purification of various industrial or other wastes and two of these can be briefly mentioned here.

Laundry Wastes.

In such laundries as we have examined, clothes are subjected to eight washes and rinses; the first wash usually contains a small amount of caustic soda without soap and this is followed by two washes with soap and five rinses. There are of course variations but this is the general procedure. The water used is heated and the highest temperature noted has been 140° F. Neither the temperature nor the caustic and soap used appeared to have any great effect on the bacterial content of these wastes. Such laundries as we have examined used about 25,000 to 30,000 gallons of water daily when in operation. The wastes can be clarified by acidification resulting in a bulky sludge difficult to handle. By this acid treatment bacteria are reduced about 97 per cent. The wastes are usually rich in coli and streptococci and the total bacteria present has averaged over 100,000 per cubic centimeter. Two small sand filters were operated for ten months. One of them received the strongest liquors after settling and was operated at a rate of from 25,000 to 50,000 gallons per acre daily. This filter became clogged at the end of three months and six inches of the upper sand were removed. Following this it was operated without difficulty for seven months with the average waste from the laundry being examined. A second filter received the same wastes as the first but after being clarified by acidification and then made slightly alkaline. The acid treatment removed about 87 per cent of the fats of the raw waste. These fats were mostly soap but with some free fat present. This filter was operated at the rate of 50,000 gallons per acre daily. At the end of ten months the effluents of both filters were clear, well nitrified and low in organic matter, showing in each case bacterial purification of about 90 per cent, and the filters were in good condition.

Wastes from the Works of a Patent Medicine Company.

This company, engaged in making patent medicines, produced a waste consisting of certain wood, bark, etc., mixed with alcohol. It was the custom of the company to wash out the tanks containing this waste and pass it into a neighboring swamp where objectionable conditions were produced. It was found by our examinations that operating in this way from sixty to seventy gallons of alcohol were wasted at each emptying, hence the company was advised not to wash the waste away but to shovel out the contents of the tanks, distill the waste or otherwise treat it for the recovery of alcohol, and then burn it. This would result in both a saving of alcohol and the abatement of the nuisance.

REPORT OF THE DIVISION OF FOOD AND DRUGS.

HERMANN C. LYTCHGOE, *Director*.

The Food and Drug Division of the Massachusetts Department of Public Health has been engaged during the year 1926 in the usual routine work of the enforcement of the milk, food, drug, cold storage, slaughtering, bakery and mattress laws; in the examination of samples submitted by police authorities and by other State Departments; as well as in the manufacture of arspenamine.

The inspectors collected and the analysts examined 6,923 samples of milk, 2,464 samples of foods other than milk, and 103 samples of drugs. A summary of the analyses of these samples is shown in tables 2, 3, and 4.

The Police Departments submitted 8,667 samples of liquor. A summary of these analyses will be found in table 5. Methanol suddenly appeared in the liquor samples submitted early in the Spring, varying in quantity from 1% to 8%. In all, 14 samples of such liquor were obtained during the year.

There were 254 prosecutions, of which 15 were discharged and 3 were dismissed. The balance resulted in conviction. Of these prosecutions, 106 related to milk and milk products; 16 related to shellfish; 27 related to meats and meat products; 10 related to maple products; 1 related to soft drinks; 2 related to eggs; 3 related to false advertising in food; 2 related to adulterated drugs; 69 related to violations of the storage laws, most of which related to cold storage eggs; and 6 related to violations of the slaughtering laws. There was one case each for violation of the bakery law; violation of the coal law; and obstruction of an inspector.

During the year a special drive was made upon restaurants advertising cream and serving material either below the standard or else cream containing condensed milk. The usual seasonal investigation was made of the condition of hamburg steak and sausages, and a special investigation was made in the Spring of the maple syrup shipped into Massachusetts from other states. In two instances persons residing without the Commonwealth were successfully prosecuted in State Courts for selling adulterated maple syrup. The usual examination of eggs was carried out in the Fall and it was found that the general public was not adverse to buying cold storage eggs provided they were sold as fresh eggs. The violations of the slaughtering laws were for illegal use of the inspection stamp; for slaughtering in the absence of the inspector; and for offering for sale unstamped meat. The complete list of cases with action thereon will be found in table 1.

The inspectors examined 423 bakeries, the defects of which in practically all instances were referred to the local boards of health which were directed to require the bakeries to be cleaned up and put in conformance with the law.

Practically all the soft drink factories in the state, except those located in Boston, have been examined for sanitary conditions as well as for the character of the material which was offered for sale. Two cases are pending against a factory for violating the sanitary food law and for operating a soft drink factory in violation of the regulations of the Department. These cases involve two different dates, upon one of which the factory was operating without the permit required by statute.

Investigations were also made relative to the copper content of soft drinks. In a few instances copper was found. In each of these cases a careful investigation was made of the factory from which the material was obtained in order to prevent further contamination of the material being manufactured. The principal cause of the copper in this class of food was the use of copper utensils, together with unsanitation on the part of the manufacturer. Whenever these copper utensils were kept clean, no copper was found in the finished product.

A carload of pears suspected of being sprayed with arsenic was held under seizure at the request of the U. S. Department of Agriculture, and samples of the pears were submitted to the Department for analysis. In less than twenty-four hours the shipment was released by the Department of Agriculture as the pears did not show the presence of arsenic in quantities sufficient to warrant a

seizure. It is interesting to note that in this instance the Inspector of the Department got in touch with the consignee before the latter was aware that the car had arrived.

Two lots of milk, representing milk from four different producers whose cows had not been tested for tuberculosis were examined for the presence of tubercle bacilli by inoculation into guinea pigs. These examinations were made by the Wassermann Laboratory and the tests were all negative.

Two Inspectors were placed upon shellfish work in connection with the issuing of certificates for interstate shipment of shellfish. The expense of this work, other than the salary of one Inspector, was borne by the shellfish appropriation.

The usual routine work was carried on relative to nominations for the position of inspector of slaughtering. Most of the nominees were renominees, of which only a few were disapproved. Many of the new nominees were incompetent and consequently were disapproved. In a few instances the local authorities complained to the Department of this action, but fortunately none of these incompetent men were approved.

One case involving violation of the slaughtering laws deserves mention. The Inspector was a new appointee, who, after considerable difficulty, finally qualified for the position. Apparently the butcher desired to "get something" on the Inspector, and he asked him to stamp the carcass of a calf which the Inspector had not seen killed. This the Inspector declined to do. After receiving information of this, the case was investigated by an Inspector of the Department, and it was found necessary to utilize the local slaughtering Inspector as a witness. Upon the witness stand he developed a severe case of "cold feet", stating that he was unable to hear certain conversation between the Inspector of this Department and a man who was unusually hard of hearing, and because of the absence of confirmation, the defendant was found not guilty. The Inspector, however, received a severe lesson and his work has been carried on in a satisfactory manner.

In the inspection of cold storage, a number of requests were received for extension of time on poultry. Business conditions seemed to warrant these extensions, which were accordingly granted. There were 130 requests for extension granted; 23 requests were refused; and in 89 instances goods were ordered removed from storage at the end of twelve calendar months, no requests for extension being received on such goods. All extensions were granted because the goods were in proper condition for further storage. The list of goods upon which extensions were granted, and the list of goods upon which extensions were refused will be found in table 6. Tables 7 and 8 give the amount of food placed in storage during the year, and the amount of food on hand on the first day of each month of the year.

The Arsphenamine Laboratory has made sufficient arsphenamine, sulpharsphenamine, and ophthalmia prophylactic to supply the needs of the Department. The general tendency is towards an increase in the use of sulpharsphenamine, together with a decrease in the use of arsphenamine. The use of arsenicals has been showing a gradually increasing tendency. During the year the Department distributed the equivalent of 21,442 doses of arsphenamine of 0.6 gram each, and the equivalent of 24,999 doses of sulpharsphenamine of 0.76 gram each.

During the year, three addresses were made, — one by Miss Berry before the Northeastern Section of the American Chemical Society on January 8, entitled "The Copper Content of Distilled Liquor on Sale in Massachusetts." This paper by Hermann C. Lythgoe, Blanchie O. Berry, and Sydney H. Hall was published in the Boston Medical and Surgical Journal of May 27, 1926. Another address entitled "Cold Storage of Food in Massachusetts" was presented by Mr. Lythgoe at the Round Table Conference on Chemistry in the Future World's Affairs at the Institute of Politics in Williamstown on August 17. This paper was published in "Ice and Refrigeration" for October, 1926. The third address, entitled "Water, the Universal Adulterant" was presented by Mr. Lythgoe before the New England Health Institute in Concord, New Hampshire on September 27, 1926 and also before the American Specialty Grocers' Association in Providence, Rhode Island upon October 7. This paper was printed in "The Nucleus", a publication of the Northeastern Section of the American Chemical Society, in March, 1927.

Mr. Sydney H. Hall submitted to the Association of Official Agricultural Chemists on October 19, a report upon the freezing point of milk and cream. This report is included in the Report of the Referee on Dairy Products and will be printed in the "Journal of the Association of Official Agricultural Chemists" in 1927.

TABLE 1. — *For Sale of Milk not of Good Standard Quality.*

NAME.	Address.	Court.	Date.	Result.
Alexander, Peter	Worcester	Worcester	Jan. 14, 1926	Conviction.
Arapos, Angelos	Worcester	Worcester	Jan. 14, 1926	Conviction. ¹
Arruda, Augustus J.	South Dartmouth	New Bedford	Aug. 20, 1926	Conviction.
Arruda, Manuel	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Barrett, James E.	Williamstown	Williamstown	Sept. 23, 1926	Conviction.
Bibeau, Eugene	Acushnet	New Bedford	Aug. 20, 1926	Conviction.
Billington, Alpheus L.	Stoughton	Stoughton	Sept. 10, 1926	Conviction.
Biron, Moise	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Blanchard, Herbert J.	Baldwinsville	Gardner	Feb. 10, 1926	Conviction.
Bourgault, John	Winchendon	Winchendon	June 15, 1926	Conviction.
Bulcock, Thomas	South Dartmouth	New Bedford	Aug. 20, 1926	Conviction.
Butler, John	North Fairhaven	New Bedford	Aug. 20, 1926	Conviction.
Buyakles, Theodore	Holyoke	Holyoke	June 11, 1926	Conviction.
Chigos, George	Springfield	Springfield	Mar. 26, 1926	Conviction.
Chigos, George	Springfield	Springfield	June 22, 1926	Conviction.
Cocoting, Nick	Salisbury	Newburyport	Aug. 21, 1926	Conviction.
Coussoule, Peter	Adams	Adams	Nov. 5, 1926	Conviction.
Dempsey, Edward F.	Williamstown	Williamstown	Oct. 28, 1926	Conviction.
Deros, Samuel	Woburn	Woburn	June 4, 1926	Conviction.
Fera, Robert	West Springfield	Springfield	Dec. 4, 1925	Conviction.
Foisie, Nelson G.	Stoneham	Woburn	July 9, 1926	Conviction.
Gill, Charles	Amesbury	Amesbury	May 21, 1926	Conviction.
Goulima, John	Cambridge	Cambridge	Feb. 9, 1926	Conviction.
Gracie, John S.	South Dartmouth	New Bedford	Aug. 20, 1926	Conviction.
Hall, Otto C.	Great Barrington	Great Barrington	Sept. 2, 1926	Conviction.
Hanos, Charles	Amesbury	Amesbury	May 21, 1926	Conviction.
Horsfall, Edmund R.	South Dartmouth	New Bedford	Aug. 20, 1926	Conviction.
Keeney, Delos C.	Springfield	Springfield	Nov. 12, 1926	Conviction.
King, John E.	Cambridge	Cambridge	Feb. 9, 1926	Conviction.
Kokkales, Charles	Newburyport	Newburyport	Feb. 24, 1926	Conviction.
Leit, Manuel C.	Acushnet	New Bedford	Aug. 20, 1926	Conviction.
Luakas, Emanuel	Stoneham	Woburn	July 9, 1926	Conviction.
Marshall, Joseph	Acushnet	New Bedford	Apr. 27, 1926	Conviction.
Marshall, William H.	Chelsea	Chelsea	Oct. 19, 1926	Conviction.
Marshall, William H.	Chelsea	Chelsea	Oct. 19, 1926	Conviction.
Marteris, Charles	Worcester	Worcester	Jan. 14, 1926	Conviction. ¹
Martha Lunch	Worcester	Worcester	Jan. 14, 1926	Conviction.
Mastera, John	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Moghabghab, Shafick	Salisbury	Newburyport	Aug. 21, 1926	Discharged.
Mullins, James	Springfield	Springfield	Jan. 12, 1926	Conviction.
Murray, George H.	Norfolk Downs	Quincy	Jan. 5, 1926	Conviction.
Pimental, Gill B.	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Purnelle, Raymond E.	Bridgewater	Brocton	Oct. 14, 1926	Conviction.
Richards, Onezime	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Ripley, William V.	Oak Bluffs	Oak Bluffs	Sept. 1, 1926	Conviction.
Salvador, Joseph S.	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Sexton, John	Maynard	Concord	Nov. 19, 1926	Conviction.
Shannon, Claude E.	Amesbury	Amesbury	May 28, 1926	Conviction.
Siell, Brouislox	Holyoke	Holyoke	Mar. 5, 1926	Conviction.
Sinisalo, Andrew	Amesbury	Amesbury	May 28, 1926	Conviction.
Sorandis, Simon	Springfield	Springfield	Dec. 10, 1925	Conviction.
Sotariow, Aappokrotas	Stoughton	Stoughton	Sept. 10, 1926	Conviction.
Talbot, Ernest	Acushnet	New Bedford	Aug. 20, 1926	Conviction.
Talbot, Joseph	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Tareises, Kyrikos	Pittsfield	Pittsfield	Oct. 1, 1926	Conviction.
Teixeira, John	Fairhaven	New Bedford	Aug. 20, 1926	Conviction.
The Boulevard Restaurant & Coffee Pot Inc.	Pittsfield	Pittsfield	Oct. 1, 1926	Conviction.
Theodore, Charles	Palmer	Palmer	June 8, 1926	Conviction.
Tuvman, Samuel	Springfield	Springfield	Nov. 13, 1926	Conviction.
Vigneault, Joseph A.	Leominster	Leominster	Feb. 3, 1926	Conviction.
Waldorf System Inc.	Fitchburg	Fitchburg	Dec. 30, 1925	Conviction.
Wong, Hong Ting	Provincetown	Provincetown	Sept. 9, 1926	Conviction.
Xenakis, James	Springfield	Springfield	Aug. 4, 1926	Conviction.
Zahos, John	Salisbury	Newburyport	Aug. 21, 1926	Conviction. ¹
Zahos, John	Salisbury	Newburyport	Aug. 21, 1926	Discharged.
Zenga, Chester M.	Cambridge	Cambridge	Mar. 9, 1926	Conviction.

For Sale of Milk from which a Portion of the Cream had been removed.

Converse Square Lunch, Inc.	Malden	Malden	Dec. 15, 1925	Conviction.
Dempsey, Edward F.	Williamstown	Williamstown	Oct. 28, 1926	Conviction.
Hart, Noel W.	Great Barrington	Great Barrington	Oct. 15, 1926	Conviction. ¹
Nugent, George C.	Gloucester	Gloucester	Sept. 21, 1926	Conviction.
Santos, Manuel	North Dartmouth	New Bedford	Aug. 27, 1926	Conviction.
Zander, Karl	Stow	Concord	June 22, 1926	Conviction.

¹ Appealed.

For Sale of Milk containing Added Water.

NAME.	Address.	Court.	Date.	Result.
Allen, Shirley	New Bedford	New Bedford	Aug. 20, 1926	Conviction.
Bennett, Matthew J.	Burlington	Woburn	Sept. 20, 1926	Conviction.
Bigelow, John	Harvard	Clinton	Sept. 11, 1926	Conviction.
Bjorbacka, Charles ¹	Hubbardston	Gardner	Sept. 10, 1926	Conviction.
Busby, Roy W.	Great Barrington	Great Barrington	Sept. 2, 1926	Conviction. ²
Chaves, Carlos	Westport	Fall River	June 4, 1926	Conviction.
Dearth, Crawford	Ashland	Framingham	Mar. 20, 1926	Conviction.
Dellegatta, Joseph	Waverley	Waltham	Sept. 10, 1926	Conviction.
Diamond, Ruben	Medford	Malden	June 2, 1926	Conviction.
Dinsmore, Orville	Berlin	Clinton	June 30, 1926	Conviction. ²
Dionne, George	Pelham, N. H.	Lawrence	Nov. 22, 1926	Conviction.
Dodge, Harold	North Beverly	Salem	Feb. 4, 1926	Conviction. ²
Elliott, John C.	Ashby	Ayer	Jan. 13, 1926	Conviction.
George, Howard F.	Salisbury	Newburyport	Aug. 21, 1926	Conviction.
George, Howard F.	Salisbury	Newburyport	Aug. 21, 1926	Discharged.
Goyette, Wilson	Plainville	Attleboro	Nov. 30, 1926	Conviction.
Helfand, William	North Dartmouth	New Bedford	Sept. 14, 1926	Conviction. ²
Jenkins, Melvin H.	Bradford	Lawrence	Nov. 22, 1926	Conviction.
Lewis, John	Westport	Fall River	Sept. 15, 1926	Conviction.
Mendoza, John	Assonet	Fall River	Jan. 27, 1926	Conviction. ²
Oliver, Manuel	New Bedford	New Bedford	Aug. 6, 1926	Conviction.
Olivera, Antone C.	South Dartmouth	New Bedford	Aug. 20, 1926	Conviction.
Pelotte, Hector J.	Draut	Lowell	Nov. 30, 1926	Conviction. ²
Songer, Paul	East Walpole	Dedham	July 19, 1926	Conviction.
Songer, Paul	East Walpole	Dedham	July 19, 1926	Conviction.
Strike, James	Great Barrington	Great Barrington	Oct. 15, 1926	Conviction.
Sylvia, Joseph	South Dartmouth	New Bedford	Nov. 2, 1926	Conviction.

For Sale of Milk containing Foreign Substance.

Hood & Sons, Inc., H. P.	Boston	Roxbury	Aug. 5, 1926	Conviction. ²
Jeppesen, Hans T.	Salem	Salem	July 26, 1926	Conviction.
Jeppesen, Hans T.	Salem	Salem	July 26, 1926	Conviction.
Stanhope, James	Pittsfield	Pittsfield	Nov. 4, 1926	Conviction. ³

Misuse of Milk Bottles.

Zander, Karl	Stow	Concord	June 22, 1926	Conviction.
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For Sale of Cream not of Good Standard Quality.

Arvanitis, Konstantine	Springfield	Springfield	May 13, 1926	Conviction. ²
Colocousis, Angel	Haverhill	Haverhill	Apr. 8, 1926	Conviction. ²
Connos, Cristi	Chicopee	Chicopee	Mar. 19, 1926	Conviction.
Couchiaftis, James G.	Springfield	Springfield	Mar. 26, 1926	Conviction.
Economidy, Anthony	Springfield	Springfield	Apr. 30, 1926	Conviction.
Fera, Robert	West Springfield	Springfield	Dec. 4, 1925	Conviction.
Fitzgerald, Thomas A.	Springfield	Springfield	May 13, 1926	Conviction.
Healey, Thomas J.	Lowell	Lowell	Mar. 30, 1926	Conviction.
Karafotis, John	Brockton	Brockton	Apr. 21, 1926	Conviction.
Kyriax, John	Haverhill	Haverhill	Apr. 8, 1926	Conviction.
Lampros, Samuel	Springfield	Springfield	Apr. 9, 1926	Conviction.
Ludden, William P.	Holyoke	Holyoke	May 7, 1926	Conviction.
Marshall, William H.	Chelsea	Chelsea	Oct. 19, 1926	Conviction.
Muswowski, Albert	Chelsea	Chelsea	Oct. 19, 1926	Conviction. ²
Panacy, John J.	Brockton	Brockton	Apr. 21, 1926	Conviction.
Panis, Basil J.	Cambridge	Cambridge	May 4, 1926	Conviction.
Panis, Basil J.	Cambridge	Cambridge	May 4, 1926	Conviction.
Phillips, James D.	Cambridge	Cambridge	May 4, 1926	Conviction.
Phinney, William H.	North Adams	North Adams	Apr. 1, 1926	Conviction.
Phinney, William H.	North Adams	North Adams	Sept. 3, 1926	Conviction.
Phinney, William H.	North Adams	North Adams	Sept. 3, 1926	Conviction.
Schick, Charles	Holyoke	Holyoke	June 17, 1926	Conviction.
Thompson, Anthony J.	Quincy	Quincy	May 5, 1926	Conviction.
Waldorf System Inc.	Springfield	Springfield	Mar. 26, 1926	Conviction.
Waldorf System Inc.	Chelsea	Chelsea	Nov. 1, 1926	Conviction.

For Sale of Cream containing Foreign Substance.

Brailey Creamery Inc.	Brockton	Brockton	Apr. 21, 1926	Conviction.
Waldorf System Inc.	New Bedford	New Bedford	June 2, 1926	Conviction.

For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products.

CLAMS.

[Contained added water.]

Brooks, William D.	Somerville	Somerville	Jan. 29, 1926	Dismissed.
Brown, Rufus S.	Salisbury	Lawrence	Jan. 8, 1926	Conviction.
Dorr & Company, Inc., Arthur E.	Norfolk Downs	Quincy	Jan. 5, 1926	Conviction.
Durbin, George	Medford	Malden	Jan. 26, 1926	Discharged.

¹ Sample collected and complaint made by Harry O. Knight, Inspector of Milk, Gardner. Analysis made by this Department. This was result of investigation first made by this Department.

² Appealed.

³ Fined \$50; sentence suspended.

For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products—
Concluded.

CLAMS—Concluded.

NAME.	Address.	Court.	Date.	Result.
Keeley, Herbert W.	Malden	Malden	Jan. 26, 1925	Discharged.
Orriss, Harry R.	Somerville	Somerville	Jan. 18, 1926	Conviction.
Rizzo, Angelo	Lawrence	Lawrence	Jan. 8, 1926	Conviction. ¹
Smith, Bloomfield	North Reading Junction	Malden	Jan. 26, 1926	Discharged.
Sperry, Stephen	Lawrence	Lawrence	Jan. 4, 1926	Conviction. ¹
Titus, Harry W.	Wollaston	Quincy	Jan. 5, 1926	Conviction.
Vierra, Alphonse	Somerville	Somerville	Jan. 21, 1926	Conviction.
White, Anthony	Somerville	Somerville	Jan. 18, 1926	Conviction.

HAMBURG STEAK.

[Selling, or offering for sale, meat containing sodium sulphite in violation of the regulations of the Department of Public Health.]

Alpert, Nathan M.	Boston	Boston	Feb. 12, 1926	Conviction.
Bielsky, Wigler	Boston	Boston	Jan. 29, 1926	Conviction.
Davidson, Alfred	North Adams	North Adams	Mar. 16, 1926	Conviction.
Gillis, Harry	Boston	Boston	Jan. 29, 1926	Conviction.
Klein, William	Lynn	Lynn	Mar. 29, 1926	Conviction.
Kronick, Cyrus	North Adams	North Adams	Mar. 16, 1926	Conviction.
Levine, Abraham	Everett	Malden	June 29, 1926	Conviction.
Oxman, Isadore	Springfield	Springfield	Apr. 30, 1926	Conviction.
Price, Max	Boston	Boston	July 30, 1926	Conviction.
Shaw, Frank	North Adams	North Adams	Mar. 16, 1926	Conviction.
Stuart, Bernard	Boston	Boston	Jan. 15, 1926	Conviction.
Tallent, Samuel	Springfield	Springfield	June 18, 1926	Conviction.
United Butchers Inc.	Attleboro	Attleboro	Nov. 10, 1926	Conviction. ²
Vigghiany, Daniel	North Adams	North Adams	Feb. 2, 1926	Conviction.
Weinberg, T. Jacob	Springfield	Springfield	June 18, 1926	Conviction.
Weinberg, Joseph	Springfield	Springfield	Apr. 30, 1926	Conviction.

MAPLE SUGAR.

[Contained cane sugar other than maple.]

Drislane, Denis J.	Lynn	Lynn	Mar. 29, 1926	Conviction.
Houle, J. Ernest	Manchester, N. H.	Lowell	July 16, 1926	Conviction.
Jackson, Mark A.	Orange.	Orange.	July 14, 1926	Conviction. ²

MAPLE SYRUP.

[Contained cane sugar other than maple.]

Gauvremont, George	Central Falls, R. I.	Lowell	June 21, 1926	Conviction.
Gauvremont, George	Central Falls, R. I.	Lowell	June 21, 1926	Conviction.
Gauvremont, George	Central Falls, R. I.	Lowell	June 21, 1926	Conviction.
Gauvremont, George	Central Falls, R. I.	Lowell	June 21, 1926	Conviction.
Gauvremont, George	Central Falls, R. I.	Lowell	June 21, 1926	Conviction.
Houle, J. Ernest	Manchester, N. H.	Lowell	July 16, 1926	Conviction.
Houle, J. Ernest	Manchester, N. H.	Lowell	July 16, 1926	Conviction.

OYSTERS.

[Contained added water.]

Sperry, Stephen	Lawrence	Lawrence	Jan. 4, 1926	Conviction.
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SAUSAGE.

[Contained starch in excess of 2 per cent.]

Battye, Louis	Lowell	Lowell	Feb. 15, 1926	Conviction.
Bourgault, John	Winchendon	Winchendon	Jan. 28, 1926	Conviction.
Epstien, Phillip	Boston	Boston	Jan. 15, 1926	Conviction.

SAUSAGE.

[Contained a compound of sulphur dioxide not properly labeled.]

Alpert, Nathan M.	Boston	Boston	Feb. 12, 1926	Conviction.
Beauchamp, Ovila	Holyoke	Springfield	Mar. 26, 1926	Conviction.
Beauchamp, Ovila	Holyoke	Springfield	Mar. 26, 1926	Conviction.
Jacobson, Max	Holyoke	Holyoke	Mar. 5, 1926	Conviction.
Mairenberg, Morris	Boston	Boston	Mar. 19, 1926	Conviction.
Wiesman, Benjamin	Boston	Boston	Mar. 19, 1926	Conviction.

SCALLOPS.

[Contained added water.]

Baxter, Joseph F.	Chatham	Harwich	Feb. 19, 1926	Conviction.
Kelly, Aaron	West Dennis	Harwich	Jan. 29, 1926	Conviction. ²
Robbins, Robert W.	Chatham	Harwich	Jan. 22, 1926	Conviction.

SOFT DRINKS.

[Contained benzoic acid.]

Lowell, George W.	Brighton	Brighton	Oct. 7, 1926	Conviction.
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¹ Continued for sentence.

² Appealed.

For Sale of Decomposed Food.

EGGS.

NAME.	Address.	Court.	Date.	Result.
Gray Company, E. E.	Framingham.	Framingham.	Jan. 15, 1926	Conviction.
Pepe, James	Lawrence	Lawrence	Mar. 10, 1926	Conviction.

SAUSAGE.

Nichols, Louis	Lawrence	Lawrence	Jan. 8, 1926	Conviction.
Shapiro, Theodore	Haverhill	Haverhill	May 14, 1926	Conviction.

False and Misleading Advertising.

FROZEN CUSTARD.

Kohr, Lester	Concessionaire from New York	Brookton	Oct. 7, 1926	Conviction.
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EGGS.

[Sale of eggs which were not fresh as fresh eggs.]

Goldman, Charles	Lowell	Lowell	Mar. 22, 1926	Conviction. ¹
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MAPLE SYRUP.

Van Dyk Company, James	Springfield	Springfield	July 30, 1926	Conviction.
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For Sale of Drugs Deficient in Strength.

SWEET SPIRIT OF NITRE.

Clemons, Raymond F.	North Adams	North Adams	Mar. 26, 1926	Conviction.
Essex Drug Company	Boston	Boston	May 20, 1926	Conviction.

For Violation of the Laws relative to Cold Storage.

SELLING COLD STORAGE EGGS WITHOUT MARKING THE CONTAINER.

Abounader, Joseph J.	Lawrence	Lawrence	Jan. 4, 1926	Conviction.
Abramson, Samuel	Malden	Malden	Jan. 26, 1926	Conviction.
Angelo, Frank	Lawrence	Lawrence	Nov. 22, 1926	Conviction.
Assaly, George	Medford	Malden	Jan. 26, 1926	Conviction.
Atter, Joseph	Gardner	Gardner	Feb. 10, 1926	Conviction.
Audette, Philias	Lowell	Lowell	Jan. 5, 1926	Conviction.
Benbeveno, John	Lawrence	Lawrence	Mar. 10, 1926	Conviction.
Berkson, Abraham	Charlestown	Charlestown	Nov. 15, 1926	Conviction.
Bigos, Joseph	Lowell	Lowell	Nov. 12, 1926	Conviction.
Bologna, Charles	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Boschetti, Dominic	North Adams	North Adams	Feb. 2, 1926	Conviction.
Bourgault, John	Winchendon	Winchendon	Jan. 28, 1926	Conviction.
Broady, Max	Lowell	Lowell	Nov. 12, 1926	Conviction.
Casey, Edward	Gardner	Gardner	Feb. 10, 1926	Conviction.
Cetlin, Charles	Newburyport	Newburyport	Jan. 19, 1926	Discharged.
Cook, Everett C.	Danvers	Salem	Jan. 7, 1926	Conviction.
Corey, William	Lawrence	Lawrence	Mar. 10, 1926	Conviction.
Cutler, Morris G.	Shirley	Ayer	Jan. 25, 1926	Conviction.
Duby, Ernest	North Adams	North Adams	Feb. 2, 1926	Conviction.
Espanilo, Manuel	Lawrence	Lawrence	Nov. 22, 1926	Conviction.
Fagundes, Frank C.	Lowell	Lowell	Nov. 12, 1926	Dismissed.
Fantini, Rinaldo	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Gilbert, Arthur	Charlestown	Charlestown	Nov. 15, 1926	Conviction.
Goodreau, Michael H.	Lawrence	Lawrence	Jan. 4, 1926	Conviction.
Gventer, Ralph	Malden	Malden	Jan. 26, 1926	Conviction.
Hajjar, Mihil	Lawrence	Lawrence	Jan. 4, 1926	Conviction.
Halstead, George	Lowell	Lowell	Jan. 5, 1926	Conviction.
Hart, Daniel	Peabody	Peabody	Jan. 6, 1926	Conviction.
Karos, Michael	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Keucevitch, Alexander	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Kirby, Patrick H.	Danvers	Salem	Jan. 7, 1926	Conviction.
Kirzmir, Benjamin	Everett	Malden	Jan. 26, 1926	Conviction.
Klein, Isadore	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Kroll, Paul	Lowell	Lowell	Feb. 15, 1926	Conviction.
Lapier, Joseph	Leominster	Leominster	Feb. 3, 1926	Conviction.
Lemire, Edward	Winchendon	Winchendon	Jan. 28, 1926	Conviction.
Levikas, Jos. M.	Lawrence	Lawrence	Jan. 4, 1926	Conviction.
Mazakowska, Aleck	Lowell	Lowell	Jan. 5, 1926	Conviction.
Melnicki, Andrew	Lawrence	Lawrence	Feb. 12, 1926	Conviction.
Miller, Harry	Lynn	Lynn	Feb. 16, 1926	Conviction.
Miller, Max	Haverhill	Haverhill	Jan. 18, 1926	Discharged.
Molcheau, Charles	Lawrence	Lawrence	Feb. 12, 1926	Conviction.
Neketuk, Michael	Lawrence	Lawrence	Nov. 22, 1926	Conviction.
Nicholopoulos, Geo.	Salem	Salem	Feb. 4, 1926	Conviction.
Novick, Abram	Lowell	Lowell	Jan. 5, 1926	Conviction.
Owen, Faris	Gardner	Gardner	Feb. 10, 1926	Discharged.

¹ Appealed.

*For Violation of the Laws relative to Cold Storage—Concluded.*SELLING COLD STORAGE EGGS WITHOUT MARKING THE CONTAINER—*Concluded.*

NAME.	Address.	Court.	Date.	Result.
Paglia, Ralph	Leominster	Leominster	Feb. 3, 1926	Conviction.
Pankevich, Benjamin	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Patturito, Dominico	Lawrence	Lawrence	Mar. 10, 1926	Conviction.
Provhcard, John	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Ready, John	Winchendon	Winchendon	Jan. 28, 1926	Conviction.
Rouine, Augustine	Lowell	Lowell	Nov. 30, 1926	Conviction.
Sall, Abraham	Lynn	Lynn	Mar. 13, 1926	Conviction.
Sarkka, Alpin	Gardner	Gardner	Feb. 10, 1926	Conviction. ¹
Savicki, Stephen	Lowell	Lowell	Jan. 5, 1926	Conviction.
Shapiro, Morris	Charlestown	Charlestown	Nov. 15, 1926	Conviction.
Slauenwhite, Finnis S. . . .	Lynn	Lynn	Feb. 16, 1926	Conviction.
Smith, Ralph	Charlestown	Charlestown	Nov. 15, 1926	Conviction.
Taraski, Wallace O. . . .	Lowell	Lowell	Feb. 15, 1926	Conviction.
Thomas Sylvian	Shirley	Ayer	Jan. 25, 1926	Conviction.
Tolios, James	Peabody	Peabody	Jan. 7, 1926	Conviction.
Tolios, James	Peabody	Peabody	Jan. 7, 1926	Conviction.
Travaglini, Alesandro	Winchendon	Winchendon	Jan. 28, 1926	Conviction.
Tucco, Nicholas	Haverhill	Haverhill	Jan. 18, 1926	Conviction.
Wein, Osher	Newburyport	Newburyport	Jan. 19, 1926	Conviction.
Winter, Reuben L. . . .	Shirley	Ayer	Jan. 25, 1926	Conviction.
Yuromskas, Bolis	Lawrence	Lawrence	Nov. 22, 1926	Conviction.
Zoumas, Aleck	Lawrence	Lawrence	Nov. 22, 1926	Conviction.

RETAILING COLD STORAGE GOODS WITHOUT DISPLAYING A SIGN MARKED "COLD STORAGE GOODS SOLD HERE."

Foihb, Morris	Charlestown	Charlestown	Nov. 15, 1926	Conviction.
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For Violation of the Laws relative to Slaughtering.

ILLEGAL USE OF STAMP.

Rising, Frank C. . . .	West Springfield	Springfield	Mar. 3, 1926	Conviction.
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SLAUGHTERING OR AUTHORIZING SLAUGHTERING IN THE ABSENCE OF INSPECTOR.

Budnick, Ezreal	Boxford	Haverhill	May 14, 1926	Discharged.
Keller, Joseph	Lowell	Lowell	May 21, 1926	Discharged.
Scibelli, Andrew	Agawam	Westfield	Mar. 9, 1926	Conviction.

SELLING, OFFERING FOR SALE, OR HAVING IN POSSESSION WITH INTENT TO SELL, UNSTAMPED MEAT.

Dumaine, Wilfred	Westport	Fall River	Aug. 12, 1926	Conviction.
Kellar, Joseph	Lowell	Lowell	May 21, 1926	Discharged.

For Violation of the Bakery Law.

Rautz, Samuel	Beverly	Salem	Feb. 12, 1926	Conviction. ¹
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For Violation of the Coal Law.

Boston, Willard J. ²	Malden	Roxbury	Jan. 26, 1926	Conviction. ¹
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Obstruction of an Inspector.

Maderos, Manuel	Dartmouth	New Bedford	Aug. 6, 1926	Conviction.
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TABLE 2. — *Summary of Milk Statistics.*³

	TOTAL SAMPLES.				SAMPLES NOT DECLARED ADULTERATED.			
	Number of Samples.	AVERAGE.			Number of Samples.	AVERAGE.		
		Total Solids.	Fat.	Solids not Fat.		Total Solids.	Fat.	Solids not Fat.
December	358	12.23	3.73	8.50	326	12.33	3.77	8.56
January	295	12.33	3.82	8.51	288	12.37	3.85	8.52
February	169	12.24	3.69	8.55	165	12.26	3.72	8.54
March	486	12.23	3.71	8.52	479	12.25	3.72	8.53
April	677	12.33	3.69	8.64	667	12.36	3.72	8.64
May	683	12.22	3.60	8.62	651	12.31	3.66	8.65
June	689	12.43	3.74	8.69	668	12.46	3.75	8.71
July	809	12.10	3.56	8.53	775	12.13	3.58	8.54
August	643	12.18	3.71	8.48	610	12.24	3.76	8.48
September	475	12.44	3.81	8.63	457	12.54	3.87	8.67
October	805	12.24	3.68	8.56	765	12.18	3.68	8.50
November	691	12.44	3.75	8.69	651	12.57	3.81	8.76
Average for Year	6,780	12.28	3.71	8.57	6,502	12.33	3.74	8.59

¹ Appealed.² Prosecuted by City of Boston Sealer of Weights and Measures; analytical work done by this Department.³ Includes only samples collected by inspectors of the department.

TABLE 3. — *Food Samples collected during 1926.*

	Genuine.	Adulterated.	Total.
Butter	14	16	30
Canned goods	8	13	21
Chocolate	1	—	1
Cheese	2	—	2
Clams	30	82	112
Coffee	1	—	1
Confectionery	4	—	4
Cream	199	85	284
Cream of Tartar	2	—	2
Dried fruits	4	5	9
Eggs	187	246	433
Flavoring extracts	1	—	1
Foreign substance in milk bottles	—	1	1
Honey	1	—	1
Jam	—	1	1
Jelly	2	1	3
Ice cream	13	2	15
Lime juice	3	—	3
Linseed oil	2	—	2
Maple sugar	57	14	71
Maple syrup	58	27	85
Meat products:			
Hamburg	41	33	74
Kiszki	1	—	1
Mince meat	1	—	1
Sausage	691	32	723
Sheep plucks	—	1	1
Milk cocoa	—	1	1
Molasses	1	—	1
Noodles	—	5	5
Oleomargarine	3	14	17
Olives	2	—	2
Olive oil	15	1	16
Orange juice	5	2	7
Oysters	5	23	28
Peanut butter	6	—	6
Pears	12	—	12
Scallops	33	—	33
Soft drinks	412	14	426
Sugar	—	1	1
Vinegar	25	5	30
Paint ¹	2	—	2
	1,844	625	2,469

TABLE 4. — *Drug Samples Collected during 1926.*

	Genuine.	Adulterated.	Total.
Citrate of magnesia	1	—	1
Alcohol	2	—	2
Hydrogen peroxide	2	—	2
Lime water	12	2	14
Prescriptions	1	—	1
Proprietary drugs	—	4	4
Spirit of camphor	2	—	2
Spirit of nitrous ether	48	22	70
Tincture of iodine	5	—	5
Police samples:			
Paregoric	2	—	2
	75	28	103

TABLE 5. — *Summary of Liquor Samples examined during 1926.*

CITIES AND TOWNS.	Beer.	Cider.	Wine.	Dis- tilled Spirits.	Ex- tracts.	Alco- hol.	Miscel- laneous.	1926 Total.	1925 Total.	1924 Total.
Amesbury	21	—	—	—	—	—	—	22	11	6
Arlington	2	—	18	13	—	4	—	37	10	1
Avon	23	—	2	11	—	—	—	36	20	4
Beverly	14	1	15	5	—	7	—	42	46	31
Boston	196	2	165	1,593	1	338	129	2,424	2,913	2,307
Braintree	6	—	12	3	—	4	—	25	21	14
Cambridge	64	1	72	354	—	39	40	570	499	494
Chelsea	6	—	1	10	—	12	—	29	20	21
Chicopee	17	—	1	1	—	—	2	21	26	10
Everett	8	—	20	41	—	2	1	72	52	43
Fall River	40	—	17	100	—	—	9	166	174	156
Fitchburg	46	—	23	24	—	17	—	110	81	52

¹ Submitted by Department of Public Welfare.

TABLE 5. — *Summary of Liquor Samples examined during 1926 — Concluded.*

CITIES AND TOWNS.	Beer.	Cider.	Wine.	Dis- tilled Spirits.	Ex- tracts.	Alco- hol.	Miscel- laneous.	1926 Total.	1925 Total.	1924 Total.
Frammingham	5	—	11	5	—	—	—	21	19	6
Gardner	4	—	1	9	—	8	—	22	40	7
Gloucester	12	2	26	29	—	26	6	101	110	42
Greenfield	6	4	—	17	—	—	—	27	107	8
Haverhill	64	1	8	12	—	2	3	90	62	22
Holyoke	20	2	1	—	—	—	—	23	10	10
Lawrence	82	—	12	99	—	28	20	241	255	209
Leominster	24	—	18	12	—	14	—	68	22	31
Lowell	328	2	23	278	—	23	42	696	669	531
Lynn	17	2	32	218	2	58	26	355	460	287
Malden	73	—	23	137	—	36	3	272	358	223
Marlborough	53	4	31	46	—	7	13	154	42	110
Medford	4	—	—	45	—	3	—	52	34	112
Methuen	17	—	2	13	—	—	—	32	7	—
Middleton	23	1	5	8	—	2	1	40	14	4
Milford	17	1	10	9	—	2	1	40	48	28
Newburyport	6	2	4	8	—	14	1	35	32	12
Newton	4	—	2	12	—	2	1	21	18	30
Norwood	4	—	4	13	—	2	—	23	14	34
Orange	11	—	9	5	—	—	—	25	34	3
Peabody	12	—	1	46	—	2	4	65	81	34
Pittsfield	15	1	9	5	—	5	1	36	60	16
Quincy	6	1	23	24	—	11	1	66	89	43
Randolph	6	—	3	8	—	3	—	20	18	19
Revere	6	—	7	37	—	16	2	68	41	27
Rockland	5	—	1	9	—	1	4	20	12	13
Salem	24	—	12	37	—	37	1	111	156	193
Salisbury	11	3	3	8	—	5	—	30	32	26
Somerville	4	—	5	47	—	6	2	64	189	162
Springfield	73	—	33	229	—	15	2	352	260	206
Stoughton	10	—	2	8	—	10	—	30	2	12
Taunton	14	—	9	37	—	—	9	69	53	22
Wakefield	6	—	26	40	—	9	2	83	63	76
Walpole	1	—	49	16	—	11	—	77	56	25
Waltham	1	—	17	22	—	19	4	63	62	41
Watertown	2	—	21	15	—	1	—	39	20	20
Webster	8	—	—	10	—	1	1	20	22	7
West Springfield	7	—	1	17	—	1	—	26	15	5
Westford	13	1	—	3	1	3	2	23	82	15
Woburn	3	—	5	30	—	2	—	40	47	17
Department of Public Safety	320	12	101	392	—	54	40	919	621	189
Miscellaneous	152	22	59	236	3	62	20	554	—	—
Totals	1,916	65	956	4,406	7	924	393	8,667	9,454	6,799

TABLE 6. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1925, to December 1, 1926.*

[Reason for such extension being that goods were in proper condition for further storage.]

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Eggs (broken-out)	30,000	Aug. 11, 1925 ¹	Aug. 31, 1926	Fairmont Creamery Co.
Eggs	16,410	Aug. 24, 1925 ¹	Aug. 25, 1926	Henningsen Brothers.
Eggs	931	July 13, 1925	Sept. 13, 1926	Keith, H. J., Co.
Egg whites	7,750	May 19, 1925	June 1, 1926	Keith, H. J., Co.
Egg whites	833	July 22, 1925	Sept. 22, 1926	Keith, H. J., Co.
Egg whites	2,580	July 18, 1925 ¹	June 16, 1926	Henningsen Brothers.
Egg whites	12,930	Aug. 11, 1925 ¹	Aug. 11, 1926	Henningsen Brothers.
Egg whites	240	Apr. 14, 1925	June 14, 1926	Lewis, Mears Co.
Egg yolks	720	Aug. 11, 1925 ¹	Aug. 11, 1926	Henningsen Brothers.
Egg yolks	5,340	Aug. 24, 1925 ¹	Aug. 25, 1926	Henningsen Brothers.
Egg yolks	1,600	July 24, 1925	Sept. 24, 1926	Keith, H. J., Co.
Egg yolks	2,730	July 21, 1925	Oct. 12, 1926	Titman Egg Co.
Egg yolks	1,590	July 22, 1925	Oct. 12, 1926	Titman Egg Co.
Egg yolks	5,790	July 24, 1925	Oct. 12, 1926	Titman Egg Co.
Egg yolks	3,390	July 25, 1925	Oct. 12, 1926	Titman Egg Co.
Egg yolks	3,750	July 27, 1925	Oct. 12, 1926	Titman Egg Co.
Egg yolks	2,580	July 28, 1925	Oct. 12, 1926	Titman Egg Co.
Egg yolks	2,310	July 29, 1925	Oct. 12, 1926	Titman Egg Co.
Butter	3,000	July 7, 1925	Sept. 17, 1926	Covitz, M., & Son.
Butter (unsalted)	7,750	June 19, 1925	Aug. 15, 1926	Fairmont Creamery Co.
Butter	1,449	May 20, 1925	Aug. 20, 1926	Lewis, Mears Co.
Butter	3,200	July 8, 1925	Sept. 8, 1926	Lewis, Mears Co.
Butter	4,410	July 20, 1925	Oct. 1, 1926	Stone, Charles H., Co.
Broilers	3,092	Dec. 11, 1924	Feb. 10, 1926	Quinn, Peter & Sons.
Broilers	1,431	Dec. 30, 1924	Feb. 28, 1926	Quinn, Peter & Sons.

¹ Imported. Original date of storage unknown.

TABLE 6. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1925, to December 1, 1926 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Chickens	12,348	Nov. 7, 1925	Jan. 30, 1927	Adams, Chapman Co.
Chickens	9,861	Nov. 16, 1925	Jan. 30, 1927	Adams, Chapman Co.
Chickens	4,457	Nov. 11, 1925	Feb. 1, 1927	Alley, Greene & Pipe Co.
Chickens	16,322	Nov. 11, 1925	Feb. 1, 1927	Alley, Greene & Pipe Co.
Chickens	2,770	Nov. 23, 1925	Feb. 1, 1927	Alley, Greene & Pipe Co.
Chickens	135	Dec. 1, 1924	Mar. 1, 1926	Burr, S. L., Co.
Chickens	3,025	Dec. 1, 1924	Mar. 1, 1926	Burr, S. L., Co.
Chickens	1,092	Dec. 6, 1924	Mar. 1, 1926	Burr, S. L., Co.
Chickens	1,126	Dec. 6, 1924	Mar. 1, 1926	Burr, S. L., Co.
Chickens	1,258	Dec. 6, 1924	Mar. 1, 1926	Burr, S. L., Co.
Chickens	157	Dec. 29, 1924	Jan. 29, 1926	Burr, S. L., Co.
Chickens	500	Dec. 29, 1924	Feb. 28, 1926	Burr, S. L., Co.
Chickens	1,296	Dec. 29, 1924	Feb. 28, 1926	Burr, S. L., Co.
Chickens	1,558	Oct. 23, 1925	Jan. 1, 1927	First National Stores, Inc.
Chickens	2,503	Nov. 16, 1925	Jan. 16, 1927	First National Stores, Inc.
Chickens	5,942	Nov. 21, 1925	Jan. 1, 1927	Hosmer, F. H., & Co.
Chickens	6,580	Dec. 15, 1925	Feb. 15, 1927	Hosmer, F. H., & Co.
Chickens	7,260	—	Jan. 9, 1926	Hosmer, F. H., & Co.
Chickens	645	Dec. 4, 1924	Mar. 1, 1926	Lamson & Co.
Chickens	579	Dec. 5, 1924	Jan. 5, 1926	Lamson & Co.
Chickens	700	Dec. 5, 1924	Apr. 5, 1926	Lamson & Co.
Chickens	788	Dec. 5, 1924	Jan. 5, 1926	Lamson & Co.
Chickens	827	Dec. 5, 1924	Apr. 5, 1926	Lamson & Co.
Chickens	1,008	Dec. 5, 1924	Mar. 5, 1926	Lamson & Co.
Chickens	1,181	Dec. 5, 1924	Mar. 5, 1926	Lamson & Co.
Chickens	1,186	Dec. 6, 1924	Mar. 1, 1926	Lamson & Co.
Chickens	1,800	Dec. 6, 1924	Jan. 6, 1926	Lamson & Co.
Chickens	1,834	Dec. 6, 1924	Mar. 1, 1926	Lamson & Co.
Chickens	1,902	Dec. 6, 1924	Mar. 1, 1926	Lamson & Co.
Chickens	1,988	Dec. 6, 1924	Jan. 6, 1926	Lamson & Co.
Chickens	4,405	Dec. 6, 1924	Mar. 1, 1926	Lamson & Co.
Chickens	155	Dec. 8, 1924	Mar. 1, 1926	Lamson & Co.
Chickens	1,120	Dec. 8, 1924	Mar. 1, 1926	Lamson & Co.
Chickens	1,623	Dec. 8, 1924	Apr. 8, 1926	Lamson & Co.
Chickens	2,814	Dec. 8, 1924	Apr. 8, 1926	Lamson & Co.
Chickens	1,733	Dec. 17, 1924	Mar. 17, 1926	Lamson & Co.
Chickens	1,127	Dec. 18, 1924	Apr. 5, 1926	Lamson & Co.
Chickens	1,495	Dec. 18, 1924	Mar. 18, 1926	Lamson & Co.
Chickens	3,212	Dec. 18, 1924	Mar. 18, 1926	Lamson & Co.
Chickens	1,157	Dec. 19, 1924	Mar. 19, 1926	Lamson & Co.
Chickens	2,008	Dec. 19, 1924	Mar. 19, 1926	Lamson & Co.
Chickens	3,961	Dec. 19, 1924	Apr. 20, 1926	Lamson & Co.
Chickens	259	Dec. 27, 1924	Mar. 27, 1926	Lamson & Co.
Chickens	1,209	Dec. 30, 1924	Mar. 30, 1926	Lamson & Co.
Chickens	588	Dec. 31, 1924	Mar. 31, 1926	Lamson & Co.
Chickens	939	Dec. 31, 1924	Mar. 31, 1926	Lamson & Co.
Chickens	1,347	Jan. 6, 1925	Apr. 6, 1926	Lamson & Co.
Chickens	1,706	Jan. 6, 1925	Apr. 6, 1926	Lamson & Co.
Chickens	4,691	Dec. 27, 1924	Mar. 1, 1926	Littlefield, J. F., & Co.
Chickens	120	Dec. 11, 1924	Feb. 11, 1926	Weston-Thurston Co.
Chickens	960	Dec. 11, 1924	Feb. 11, 1926	Weston-Thurston Co.
Ducks	1,368	Dec. 1, 1924	Jan. 1, 1926	Lamson & Co.
Geese	645	Nov. 26, 1924	Dec. 26, 1925	Bartlett Varney & Co.
Geese	3,025	Nov. 26, 1924	Dec. 26, 1925	Bartlett Varney & Co.
Geese	134	Nov. 28, 1924	Jan. 15, 1926	Kimball, J. F., & Co., Inc.
Geese	141	Nov. 26, 1924	Jan. 15, 1926	Kimball, J. F., & Co., Inc.
Geese	495	Nov. 26, 1924	Jan. 15, 1926	Kimball, J. F., & Co., Inc.
Geese	1,680	Nov. 26, 1924	Jan. 15, 1926	Kimball, J. F., & Co., Inc.
Geese	453	Dec. 2, 1924	Jan. 2, 1926	Lamson & Co.
Geese	1,993	Dec. 2, 1924	Jan. 2, 1926	Lamson & Co.
Geese	3,737	Dec. 5, 1924	Jan. 5, 1926	Lamson & Co.
Turkeys	1,047	Jan. 5, 1925	Mar. 15, 1926	Moulton, Edwin H., Co.
Bear meat	49	Oct. 26, 1925	Dec. 26, 1926	Batchelder & Snyder Co.
Bear meat	31	Nov. 14, 1925	Jan. 14, 1927	Batchelder & Snyder Co.
Bear meat	34	Nov. 14, 1925	Jan. 14, 1927	Batchelder & Snyder Co.
Bear meat	197	Nov. 19, 1925	Jan. 19, 1927	Batchelder & Snyder Co.
Bear meat	44	Oct. 21, 1925	Dec. 21, 1926	Batchelder & Snyder Co.
Bear meat	70	Oct. 21, 1925	Dec. 21, 1926	Batchelder & Snyder Co.
Bear meat	90	Oct. 23, 1925	Dec. 26, 1926	Batchelder & Snyder Co.
Bear meat	13	Nov. 6, 1925	Jan. 6, 1927	Batchelder & Snyder Co.
Bear meat	55	Nov. 6, 1925	Jan. 6, 1927	Batchelder & Snyder Co.
Bear meat	58	Nov. 11, 1925	Jan. 11, 1927	Batchelder & Snyder Co.
Moose meat	76	Oct. 21, 1925	Dec. 21, 1926	Batchelder & Snyder Co.
Moose meat	272	Nov. 13, 1925	Jan. 13, 1927	Batchelder & Snyder Co.
Beef hips	877	Nov. 17, 1925	Dec. 17, 1926	First National Stores, Inc.
Beef livers	18,637	Nov. 13, 1924	May 31, 1926	Morris & Co.
Beef livers	1,815	Dec. 7, 1925	Jan. 7, 1927	Fletcher, J. V., Co.
Beef tenderloins	740	Apr. 15, 1925	June 1, 1926	Swift & Co.
Bass, sea	170	June 15, 1925	June 19, 1926	Foley, M. F., Co.
Bass, striped	115	June 6, 1925	June 24, 1926	Dorr, Arthur E., & Co., Inc.

¹ Date of deposit unknown.

TABLE 6. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1925, to December 1, 1926 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Bass, striped	173	June 10, 1925	June 24, 1926	Dorr, Arthur E., & Co., Inc.
Butterfish	287	June 16, 1925	July 16, 1926	Foley, M. F., Co.
Butterfish	8,476	Sept. 16, 1925	Dec. 16, 1926	Rowe & Sullivan.
Butterfish	978	Sept. 22, 1925	Oct. 22, 1926	Rowe & Sullivan.
Devilfish	160	Feb. 16, 1926 ¹	Dec. 31, 1926	Mantia, S., & Co.
Eels	250	Aug. 14, 1926 ¹	Nov. 14, 1926	Corso Brothers.
Eels	300	Apr. 3, 1926 ²	Dec. 18, 1926	Tocco, Joseph.
Halibut	3,414	Jan. 13, 1926 ²	Sept. 13, 1926	Batchelder & Snyder Co.
Halibut	400	Nov. 3, 1925	Jan. 1, 1927	Harding, F. E., Co.
Halibut	655	Oct. 22, 1925	Nov. 22, 1926	Henry & Close.
Mackerel	980	June 25, 1925	Aug. 25, 1926	Dorr, Arthur E., & Co., Inc.
Mulletts	1,025	Nov. 5, 1925	Dec. 18, 1926	Corso Brothers.
Mulletts	1,140	Nov. 30, 1925	Dec. 18, 1926	Corso Brothers.
Mulletts	3,450	Mar. 19, 1925	Jan. 19, 1927	Russo & Sons.
Mulletts	2,700	Oct. 31, 1925	Dec. 31, 1926	Russo & Sons.
Mulletts	630	Nov. 6, 1925	Jan. 6, 1927	Russo & Sons.
Salmon, silver	3,000	Dec. 28, 1925 ²	Oct. 28, 1926	Batchelder & Snyder Co.
Sardine herrings	4,782	Oct. 14, 1925	Dec. 1, 1926	Booth Fisheries Co.
Sardine herrings	4,088	Oct. 15, 1925	Dec. 1, 1926	Booth Fisheries Co.
Smelts	225	Apr. 30, 1926 ²	Dec. 30, 1926	Corso Brothers.
Smelts	500	Apr. 16, 1926 ²	Dec. 16, 1926	Tocco, Joseph.
Smelts	1,266	Oct. 23, 1925	Dec. 1, 1926	Zizzo, F. & L.
Sole	2,750	Mar. 26, 1925	Apr. 26, 1926	Hunt, Cassius & Co.
Swordfish	507	Mar. 30, 1926 ¹	Oct. 30, 1926	Goodspeed, L. B., & Co.
Swordfish	1,772	July 29, 1925	Dec. 1, 1926	Schermerhorn Fish Co.

TABLE 7. — *Requests for Extension of Time not granted on Goods in Cold Storage from December 1, 1925, to December 1, 1926.*

ARTICLE.	Weight (Pounds.)	Placed in Storage.	Name.
Eggs (broken-out)	9,280	July 19, 1925	Keith, H. J., Co.
Egg yolks	3,900	Aug. 24, 1925	Henningsen Brothers.
Butter		Oct. 26, 1925	Flynn's Market.
Butter	16,055	July 1, 1925	Haire, William J.
Butter	6,615	July 14, 1925	Hathaway, C. F., & Sons, Inc.
Butter	256	June 22, 1925	Lewis, Mears Co.
Butter	14,818	Aug. 21, 1925	Lewis, Mears Co.
Butter	12,524	Aug. 28, 1925	Lewis, Mears Co.
Chickens	9,318	Oct. 23, 1925	Hosmer, F. H., & Co.
Chickens	1,210	Oct. 24, 1924	Lamson & Co.
Chickens	1,732	Oct. 24, 1924	Lamson & Co.
Chickens	346	Dec. 2, 1924	Lamson & Co.
Chickens	557	Dec. 2, 1924	Lamson & Co.
Chickens	1,100	Dec. 6, 1924	Lamson & Co.
Geese	2,664	Dec. 1, 1924	Lamson & Co.
Beef tenderloins	50	June 6, 1925	Kadish, R.
Beef tenderloins	86	June 6, 1925	Kadish, R.
Eels	20	—	⁻¹ Tocco, Joseph.
Eels	41	—	⁻¹ Tocco, Joseph.
Eels	60	—	⁻¹ Tocco, Joseph.
Eels	200	Sept. 2, 1925	Tocco, Joseph.
Eels	75	Sept. 11, 1925	Tocco, Joseph.
Mulletts	6,200	Nov. 2, 1925	Mantia, S., & Co.

TABLE 8. — *Articles which had been in Cold Storage longer than Twelve Months and on which no Requests for Extensions had been made, ordered removed from December 1, 1925, to December 1, 1926.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Butter	48	July 16, 1925	Cummington Creamery Co.
Butter	910	July 11, 1925	Lowney, The Walter M., Co.
Broilers	220	Nov. 29, 1924	Burr, S. L., Co.
Broilers	625	Dec. 6, 1924	Burr, S. L., Co.
Broilers	76	Dec. 2, 1924	Eastman, Frank B.
Broilers	70	Feb. 13, 1925	Quinn, Peter & Sons.
Broilers	320	Sept. 2, 1925	Robbins, Nathan, Co.
Broilers	200	Dec. 8, 1924	Strong, Marson Co.
Capons	146	Mar. 4, 1925	Hosmer, F. H., & Co.
Chickens	296	Oct. 12, 1925	Hosmer, F. H., & Co.
Chickens	2,907	Jan. 2, 1925	Hosmer, F. H., & Co.
Chickens	960	Dec. 27, 1924	Lawrence, H. L., Co.

¹ Date of deposit unknown.² Received frozen and undated.

TABLE 8. — *Articles which had been in Cold Storage longer than Twelve Months and on which no Requests for Extensions had been made, ordered removed from December 1, 1925, to December 1, 1926 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Chickens	169	Oct. 12, 1925	Lepman, H. & J.
Chickens	191	Oct. 12, 1925	Lepman, H. & J.
Chickens	193	Oct. 12, 1925	Lepman, H. & J.
Chickens	215	Oct. 12, 1925	Lepman, H. & J.
Chickens	226	Oct. 12, 1925	Lepman, H. & J.
Chickens	245	Oct. 12, 1925	Lepman, H. & J.
Chickens	253	Oct. 12, 1925	Lepman, H. & J.
Chickens	284	Oct. 12, 1925	Lepman, H. & J.
Chickens	291	Oct. 12, 1925	Lepman, H. & J.
Chickens	351	Oct. 12, 1925	Lepman, H. & J.
Chickens	336	Dec. 5, 1924	Page Brothers.
Chickens	43	Nov. 22, 1924	Ruff, A.
Chickens	75	Jan. 15, 1925	Sage, E. R., Co.
Chickens	40	Sept. 14, 1925	Soracco, Thomas.
Chickens	59	Nov. 22, 1924	Strong, Marson Co.
Chickens	646	Oct. 6, 1925	Swift Beef Co.
Chickens	2,062	Oct. 28, 1924	Wheeler, T. H., Co.
Chickens	11,582	Oct. 28, 1924	Wheeler, T. H., Co.
Ducks	144	Nov. 28, 1924	Armour & Co.
Poultry	130	July 16, 1925	Boynton-Boston, Inc.
Turkeys	1,911	Nov. 28, 1924	Boynton-Boston, Inc.
Turkeys	77	Jan. 30, 1925	Keeney, F. A.
Turkeys	43	Dec. 27, 1924	Ruff, A.
Bear meat	94	Nov. 24, 1924	Turco, George.
Deer meat	8	Nov. 14, 1925	Baker, D. M.
Venison	64	Nov. 28, 1924	Bigelow, Nelson.
Venison	47	Nov. 10, 1924	Nesmith, F. H.
Venison	30	Dec. 8, 1924	Phillips, Dr. G. L.
Raccoon	50	July 28, 1925	Turco, George.
Beef	320	Dec. 5, 1924	Massachusetts Industrial School for Girls.
Beef	202	Nov. 29, 1924	Kurland, A.
Beef	375	Nov. 11, 1924	Kurland, A.
Beef	120	July 23, 1925	Stollar, R.
Beef ends	1,440	July 10, 1925	Boynton-Boston, Inc.
Beef hips	483	Oct. 14, 1925	Quigley, M. J., & Son.
Beef loins	65	Nov. 13, 1924	Boynton-Boston, Inc.
Beef loins	65	July 24, 1925	Boynton-Boston, Inc.
Beef rounds	1,650	Dec. 20, 1924	Webster Packing Co.
Beef rumps	348	July 24, 1925	Boynton-Boston, Inc.
Beef sirloins	100	July 24, 1925	Boynton-Boston, Inc.
Beef tenderloins	55	Nov. 12, 1925	Kadish, R.
Beef tenderloins	—	—	¹ Morris & Co.
Beef tongues	110	Nov. 6, 1924	Kurland Brothers.
Lamb	50	July 23, 1925	Stollar, R.
Calves' livers	389	Sept. 9, 1925	Armour & Co.
Calves' livers	41	May 26, 1925	Boynton-Boston, Inc.
Calves' livers	41	May 29, 1925	Boynton-Boston, Inc.
Pork	100	Sept. 21, 1925	Osgood, C. H.
Veal cutlets	—	—	¹ Morris & Co.
Miscellaneous meats	110	July 9, 1925	Boynton-Boston, Inc.
Eels	60	Sept. 11, 1925	Cefalu, Joseph.
Eels, sand	180	Sept. 21, 1925	Cefalu, Joseph.
Eels	300	Nov. 28, 1924	Cefalu, Joseph.
Eels	100	Aug. 14, 1925	Cefalu, Joseph.
Eels	150	Aug. 15, 1925	Cefalu, Joseph.
Eels	41	May 27, 1925	Tocco, Joseph.
Eels	80	Aug. 6, 1925	Tocco, Joseph.
Eels	175	Aug. 12, 1925	Tocco, Joseph.
Eels	180	Aug. 18, 1925	Tocco, Joseph.
Eels	250	Aug. 26, 1925	Tocco, Joseph.
Halibut	800	Sept. 4, 1925	Dorr, Arthur E., & Co., Inc.
Halibut	1,000	May 5, 1925	First National Stores, Inc.
Mackerel	152	Aug. 1, 1925	Bank's Fish Market.
Mackerel	150	June 2, 1925	Schermerhorn Fish Co.
Mullets	1,200	Oct. 31, 1925	Mantia, S., & Co.
Pollock	185	Nov. 21, 1924	Baker, A. G.
Sardine herrings	785	Nov. 2, 1925	Ferraria, Tony.
Sardine herrings	1,000	Nov. 2, 1925	Ferraria, Tony.
Scallops	64	Dec. 11, 1924	Arrington, H. R.
Smelts	220	Oct. 22, 1925	Cefalu, Joseph.
Smelts	68	Jan. 14, 1925	Corso & Cannizzo.
Smelts	820	Apr. 30, 1926 ²	Mantia, S., & Co.
Smelts	210	Dec. 13, 1924	Tribuna-Magri Co.
Swordfish	751	July 20, 1925	Atwood & Co., Inc.
Swordfish	663	Aug. 5, 1925	Atwood & Co., Inc.
Whiting	880	June 18, 1925	Cannizzo, Joseph.
Whiting	150	Oct. 30, 1925	Cefalu, Joseph.

¹ Date of deposit unknown.² Received frozen and undated.

TABLE 9. — *Summary.*

Requests for extension of time granted	130
Eggs	18
Butter	5
Poultry	64
Game	12
Meat	4
Fish	27
Requests for extension of time not granted	23
Eggs	2
Butter	6
Poultry	7
Meat	2
Fish	6
Articles ordered removed from storage (no requests made)	89
Butter	2
Poultry	33
Game	6
Meat	21
Fish	27

TABLE 10. — *Articles Other than Fish placed in Cold Storage from December 1, 1925, to December 1, 1926.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
December												
January	581,532	302,250	234,431	63,037	1,232,762	383,038	784,227	111,615	407,367	1,783,101	156,013	838,951
February	419,103	326,660	220,189	95,766	693,124	410,907	272,166	45,573	536,237	3,707,422	158,215	689,681
March	694,889	353,720	192,711	79,254	287,127	262,842	174,629	30,055	804,565	2,320,733	162,269	744,159
April	415,784	330,200	315,917	60,945	327,639	209,195	81,853	67,367	293,444	1,475,264	180,496	469,980
May	750,514	3,491,040	572,626	139,321	297,591	147,647	26,031	86,479	496,456	1,197,334	37,550	682,175
June	1,484,222	4,921,170	417,331	163,171	298,093	188,625	55,176	164,500	889,244	2,326,859	26,146	911,416
July	7,229,837	4,192,980	1,001,610	64,807	309,397	308,384	49,281	308,983	980,313	2,385,079	304,318	1,326,386
August	7,553,736	1,755,260	986,549	116,462	241,433	382,944	41,717	176,143	605,355	2,235,638	58,371	1,404,405
September	2,996,696	1,219,620	317,214	132,851	255,625	242,434	29,570	248,760	223,545	1,732,230	112,580	993,457
October	2,248,455	866,520	379,459	379,459	370,859	97,911	18,189	199,376	299,329	1,732,230	35,229	1,229,560
November	768,316	481,260	355,955	241,949	964,539	66,480	66,480	199,376	699,891	702,199	98,990	850,965
December	429,498	488,220	281,656	237,730	1,674,341	389,703	152,550	238,312	632,353		75,892	945,193

TABLE 11. — *Fish placed in Cold Storage from December 15, 1925, to December 15, 1926.*

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall and Silver Salmon (Pounds).	Salmon, all Other (Pounds).	Shad (Pounds).	Smelts, Eula- chon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish (Pounds).
January	400	150	1,500	110,701	253,607	352,274	162,401	78,750	153,473	73,870	307,318	415,427	10,510	—	79,343
February	—	720	—	8,300	222,702	292,083	181,292	32,746	43,770	—	274,134	373,959	1,893	40,912	76,891
March	125	27,369	551	23,296	4,841	433,049	106,618	49,559	7,224	—	170,010	604,820	1,111	30,467	149,571
April	—	362	—	43,360	68,319	145,775	28,620	—	37,331	10,710	41,869	217,604	2,102	26,847	93,675
May	2,200	68,803	2,290	92,397	138,576	968,360	462,254	—	37,331	8,840	6,085	187,518	—	—	332,949
June	—	5,300	5,135	155,996	55,541	388,583	422,631	240	30,404	33,182	276	149,485	—	2,026,365	344,991
July	—	95,175	4,960	130,154	82,723	449,013	3,228,946	2,182	149,982	7,606	50	118,323	—	2,550,290	488,998
August	—	4,785	30,272	614,036	160,932	409,013	2,827,839	15,233	29,786	—	—	149,658	2,641	1,552,988	324,395
September	1,760	101,169	29,984	260,829	55,689	393,666	1,621,534	55,555	49,496	—	—	205,749	2,396	761,418	246,054
October	—	16,212	14,323	263,430	71,571	388,716	313,630	26,370	36,576	—	—	799,739	4,198	285,960	229,523
November	—	3,247	8,963	232,257	256,968	227,435	170,308	107,151	63,113	—	42,019	658,155	380	88,750	353,810
December	2,748	2,313	8,607	96,470	88,343	237,360	40,405	45,733	20,399	—	28,312	311,264	3,906	234,703	271,710

TABLE 12. — *Articles Other than Fish on Hand in Cold Storage on the First Day of the Month, from January 1, 1925, through December 1, 1926.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
January	8,356,954	3,436,440	1,895,683	690,995	3,207,291	711,788	553,083	571,523	1,535,851	1,452,812	454,670	1,578,214
February	5,299,580	1,507,080	1,532,840	578,410	3,419,380	899,620	632,762	442,737	1,412,097	4,279,163	504,792	1,583,220
March	4,135,335	1,118,020	977,295	514,985	3,100,696	852,643	685,417	319,027	1,929,873	5,912,982	630,369	1,726,424
April	2,619,634	331,830	775,642	422,788	2,542,675	586,578	641,876	254,400	1,875,610	5,615,252	750,798	1,501,016
May	1,730,184	3,327,150	895,538	365,062	2,044,052	375,333	533,055	230,014	1,929,178	5,643,575	610,400	1,528,169
June	2,208,854	7,581,450	987,563	278,507	1,628,566	402,289	495,460	281,326	1,936,840	5,340,485	433,585	1,688,991
July	8,609,520	10,622,910	1,525,905	238,280	1,332,536	570,701	460,601	495,866	2,476,419	6,808,636	542,026	2,146,031
August	15,046,457	11,103,120	2,142,584	288,749	1,034,754	803,607	429,474	521,731	2,374,944	7,677,380	494,040	2,901,595
September	16,251,973	10,815,300	2,130,488	360,590	808,997	820,223	383,751	617,809	2,056,594	6,410,470	503,919	2,934,591
October	15,932,970	9,363,270	1,967,256	694,452	829,192	711,843	321,065	688,227	1,606,689	4,817,432	475,985	2,698,319
November	13,442,388	7,091,520	1,779,091	896,687	1,561,762	558,494	276,136	724,889	1,514,159	2,811,800	523,985	2,425,856
December	9,362,843	4,429,470	1,537,570	1,068,791	3,056,793	833,307	284,158	816,457	1,847,489	2,318,800	540,724	1,976,270

TABLE 13. — *Fish on Hand in Cold Storage on the Fifteenth Day of the Month, from January 15, 1925, through December 15, 1926.*

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall and Silver Salmon (Pounds).	Salmon all Other (Pounds).	Shad (Pounds).	Smelts, Eulachon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish (Pounds).
January	1,870	86,150	2,153	264,859	321,503	1,089,296	1,909,423	204,614	186,826	11,903	294,648	838,164	14,634	3,151,948	646,218
February	1,011	54,864	561	87,464	240,662	903,233	1,081,368	184,345	160,129	36,482	482,130	503,105	6,364	2,050,069	466,363
March	986	36,462	1,112	45,175	24,542	874,596	298,803	180,455	51,504	15,066	484,173	529,172	2,274	372,578	369,374
April	235	14,573	—	22,317	56,287	660,450	33,464	31,861	14,821	1,255	277,309	358,985	1,200	44,792	148,703
May	2,275	76,186	2,290	61,609	143,834	1,029,417	351,746	12,737	1,178	460	182,938	387,252	350	3,615	367,040
June	2,200	79,332	3,000	201,443	168,781	1,028,085	685,265	11,592	1,677	4,232	167,596	1,282,326	204	2,027,265	585,301
July	2,200	156,142	1,664	330,587	220,063	1,076,232	3,833,934	13,527	80,828	11,788	163,347	1,336,985	204	5,457,290	1,016,199
August	3,920	254,250	16,673	923,958	313,932	1,071,584	6,606,267	17,219	30,164	6,388	161,565	1,097,983	1,340	6,693,869	1,992,142
September	3,920	254,250	27,276	1,163,427	333,595	1,070,712	8,135,950	52,659	61,465	6,338	138,523	1,115,778	1,700	7,048,309	1,192,200
October	3,848	264,759	28,282	1,393,777	339,589	990,867	8,170,356	73,779	61,465	6,088	132,162	1,615,487	2,215	6,691,748	1,106,690
November	6,416	245,785	28,171	1,583,834	515,453	1,142,514	7,364,101	156,822	111,823	6,088	187,482	1,798,898	2,430	5,367,857	1,257,887
December	6,056	186,763	24,713	1,166,028	347,156	1,010,248	6,120,290	167,669	47,872	3,832	102,694	1,587,106	2,745	4,754,298	923,102

REPORT OF DIVISION OF COMMUNICABLE DISEASES.

CLARENCE L. SCAMMAN, *Director*.

The functions of the division may be roughly outlined as being carried on by (a) an epidemiological staff, (b) a venereal disease staff, (c) a bacteriological laboratory and (d) a field force of seven District Health Officers, the direct representatives of the Commissioner in their respective districts, but included in the personnel of the division for administrative purposes.

This year the cases of communicable disease show an increase over the number reported last year, the figures being 100,455 and 93,082, respectively. This increase has been due to an unusually high incidence of measles and influenza in the first four months of the year and continued high prevalence of chicken pox, mumps, scarlet fever and whooping cough throughout the year. Of the 38 reportable diseases represented by 100,455 cases, there is a specific preventive or curative measure in seven, namely: diphtheria, ophthalmia neonatorum, rabies, smallpox, syphilis, tetanus and typhoid fever. This group of diseases, however, represents less than 8% of the total cases reported. In measles, scarlet fever and whooping cough there is promise of specific immunizing measures which may be applied popularly toward their prevention. With the majority of the balance of the reportable diseases, there is little to be said in the direction of specific prevention. Curative sera, or vaccines, have been developed for some diseases which, if given early, will unquestionably save lives. For such diseases as anterior poliomyelitis, chicken pox, german measles, gonorrhea, influenza, mumps and pneumonia, control lies for the present as it has in the immediate past in isolation and education. The transmission of almost all the communicable diseases takes place by the route that infected body discharges take from the patient, or carrier, to the uninfected individual according to Hill. Obviously then persons, not things, spread disease. When this single fact has become a part of the general knowledge of the public, control of communicable disease by isolation will be more a fact and less a fiction.

Having in mind the variety of administrative methods for the control of communicable disease, the Massachusetts Association of Boards of Health on October 28, 1926, adopted a set of minimum quarantine requirements which if accepted by the cities and towns in the Commonwealth will at least give less variation in these procedures than has been the rule in the past. Similar minimum requirements were adopted by the Department and will be mailed to the local boards of health early in the coming year.

Anterior Poliomyelitis.—There were 245 cases reported for the year. The case rate for 1926 was 5.8 per 100,000 population, which is not appreciably higher than the average case rate for the five years 1921–25. The incidence of the disease, however, in Springfield and Worcester compared with the rest of the state has been unusually high. The morbidity rates for the two cities taken together being 22.4 per 100,000 population. From June to October the Department, with the cooperation of the Harvard Infantile Paralysis Commission, made a special epidemiological study of this disease but no new facts were brought out in regard to the method of its spread.

Diphtheria.—The decline in diphtheria prevalence began in the fall of 1924 and has continued through 1925 and 1926. The reported number of cases this year being 3,401, which gives a case rate of 80.6 per 100,000 population; this rate is lower by far than any similar rate in the last twenty-five years. The death rate (5.8) is showing a very definite decline and is lower this year than any year in the history of the Department. The fatality rate this year is 7.1. The fatality rate during the last twenty-one years has been dropping at approximately a rate of one tenth per cent a year. Some of the decrease in diphtheria incidence is due to the increased use of immunization by means of toxin-antitoxin, but it is not likely that the decrease is due to immunization alone. In fact, there is enough increase in the prevalence of diphtheria in the last two months of the year to warrant the assumption that in 1927 the reported incidence will be greater than in 1926.

Influenza. — The incidence of this disease for the year with 2,194 cases is higher than for any previous year since 1923 when 2,466 cases were reported. The increase for the year is accounted for by the unusual prevalence of the disease in the months of March and April. Although outbreaks of the disease have been reported from Europe and in some of the southern and western states in December, there has been little increase in the reported incidence of the disease for the same period in this state.

Smallpox. — The only cases of smallpox occurring for the twelve months of the year were reported from Upton in April; there were no deaths. The disease was contracted in Florida. Although the incidence of this disease for the last few years has been extremely low within the Commonwealth, compared with its widespread prevalence throughout the Union, it will continue to be a relatively rare disease with us only so long as the vaccination law is enforced, and no longer.

Typhoid Fever. — 547 cases and 61 deaths from this disease were reported for the year, fewer than have ever been recorded in any previous year. An irreducible minimum in the incidence of this disease will be reached only when persons suspected of having the disease (convalescents, known carriers and those persons with a past history of having had the disease) are excluded from the handling of community foods. Subsequently in this report sources of infection are given where known.

SUMMER CAMPS.

This division, in cooperation with the Engineering Division, made 105 detailed inspections of summer camps. Approximately 63% of the camps had medical supervision of the registrants during their stay in camp. About 50% required physical examination of registrants before going to camp. Little or no attention was given to the examination of food handlers. No stool or urine specimens were required of any food handler as an aid toward the discovery of a typhoid "carrier". No camps required prophylaxis against diphtheria, typhoid fever, or smallpox. About half the camps used pasteurized milk. The water supplied to 29% of the camps was found unsatisfactory. Methods of sewage disposal were unsatisfactory in about 13%. A summary of these facts will be found in the report of the Engineering Division. Because of the evidence brought out by the survey, the department will introduce legislation asking for power to make rules and regulations under which local boards of health may license summer camps.

Forty-eight states, the District of Columbia and eight provinces were circularized for information as to rules and regulations governing the operation of summer camps within their borders. Twenty-nine states, the District of Columbia and three Canadian provinces have such rules and regulations. Eight other states are contemplating such legislation.

MILK LEGISLATION.

In view of the department's interest in milk legislation it is noted that 20 towns with a population of 1,684,172 or 39.9 per cent of the total state population, require that the milk sold in their communities be pasteurized or from tuberculosis free herds.

VENEREAL DISEASE.

The cases of gonorrhea and syphilis reported this year were slightly less than in 1925. Subsequently, a table shows the cases and deaths reported for the last nine years. As in the immediate past, efforts toward control of these two diseases have been centered on treatment and the broad educational aspects of social hygiene.

There are forty-eight treatment centers in the state, sixteen of which are subsidized by the department; 15,045 individuals made 128,188 visits to the sixteen state approved clinics in 1926.

The social worker and special investigator on the staff have been concerned with the following activities: investigation of sources of infection, as well as lapsed and delinquent cases; visits to local boards of health, community social agencies, courts, probation officers and police officials. This contact with all the community

forces concerned has been of mutual advantage in efforts toward the control of these diseases.

In the direction of education, 88 lectures to nearly 7,000 people have been given on the subject of social hygiene. These talks have been made possible by the American Social Hygiene Association and the Massachusetts League of Women Voters in cooperation with the department. The services of the lecturer, Dr. Helen I. McGillicuddy, have been in constant and increasing demand.

DISTRICT HEALTH OFFICERS.

Beside their ordinary routine of visits to local boards of health and investigations of outbreaks of communicable disease, and other duties required by statute such as the inspection of jails, lockups, hospitals, and so forth, the District Health Officers have been engaged in the following special activities this year: aiding and proposing immunization against diphtheria; assisting in the furthering of the ten-year tuberculosis program, aiding in a goitre survey, the result of which will appear in a later report; inspecting summer camps; interviewing boards of health in regard to their requirements for the control of contagious disease to the end that there may be more uniformity in practice in this regard throughout the Commonwealth. Some of the District Health Officers have given material aid to the department in the establishment of cancer clinics in their respective districts.

THE BACTERIOLOGICAL LABORATORY.

During the year ending December 31, 1926, the Bacteriological Laboratory examined 25,327 specimens. There has been a marked decrease in the number of diphtheria cultures received this year and a slight decrease in the number of specimens received for the Widal test, malaria and pneumococcus type determination. There has been an increase in all other lines of work and the decided increase, marked last year, in the number of examinations for typhoid bacilli has been surpassed this year. The increase in the amount of typhoid culture work has been due partially to the examination of food handlers in State sanatoria.

The laboratory examines all throat cultures received for diagnosis for diphtheria for the organisms of Vincent's Angina, also. This is a supplementary examination which is not counted in the total number of examinations.

This laboratory does not examine every throat culture for hemolytic streptococci but if the physician's diagnosis is septic sore throat, scarlet fever or streptococcus sore throat an examination is made for hemolytic streptococci.

A study was made of the viability of a hemolytic streptococcus in lobster salad at the time of the outbreak of scarlet fever in Weymouth. This has been reported in detail elsewhere.

TABLE I. — *Shows the Number and Kinds of Examinations.*

Diphtheria	11,486	Malaria	65
Tuberculosis	4,311	Pneumonia	456
Typhoid fever Widal test	1,664	Miscellaneous	867
Typhoid fever Culture test	1,652		
Gonorrhea	4,826	Total	25,327

TABLE II. *Shows Results of Examinations.*

	Positive.	Negative.	Atypical.	Total.
Diphtheria (primary)	649	7,390	—	8,039
Diphtheria (secondary)	1,235	2,212	—	3,447
Tuberculosis (sputum)	968	3,343	—	4,311
Typhoid fever (Widal)	305	1,304	55	1,664
Typhoid fever (culture)	69	1,583	—	1,652
Malaria	3	62	—	65
Gonorrhea	989	3,837	—	4,826
Pneumococcus Type Determination				456
Type I				
Number				50
Per cent			15.4	
Type II				
Number				21
Per cent			6.5	
Type III				
Number				48
Per cent			14.8	
Group IV				
Number				205
Per cent			63.3	
No pneumococci				132
Miscellaneous ¹				867
Total				25,327

CHANGES IN PERSONNEL.

January 1, 1926 — Dr. W. G. Webber appointed Acting Director of Division.
 January 1, 1926 — Dr. H. L. Lombard appointed Acting District Health Officer.
 April 1, 1926 — Dr. W. G. Webber, Acting Director, resigned.
 April 1, 1926 — Dr. C. L. Scamman, appointed Director of Division.
 June 1, 1926 — Dr. H. L. Lombard transferred to Division of Administration.
 June 25, 1926 — Dr. A. P. Black appointed Epidemiologist.
 August 5, 1926 — Dr. E. A. Lane appointed Acting District Health Officer.
 October 1, 1926 — Mr. H. C. Mosman, Special Investigator, transferred to Division of Food and Drugs.
 October 31, 1926 — Dr. A. P. Black, Epidemiologist, resigned.
 November 1, 1926 — Dr. F. C. Forsbeck appointed Epidemiologist.

REPORT OF EPIDEMIOLOGIST FOR 1926.

OUTBREAKS TRACED TO EXTERNAL AGENCIES.

December, 1925—	Lawrence	Typhoid	8 cases	Water borne.
January, 1926				
June	Lynn, Salem, Weymouth	Scarlet fever	138 cases	Food.

A total of 138 cases with no deaths resulted from the eating of a contaminated food served at three banquets by the same caterer.

June	Somerville	Typhoid	6 cases	Carrier.
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Six cases with no deaths caused by a carrier contaminating a food used in common.

September–October	Waverley	Typhoid	21 cases	Milk.
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¹ Including 487 tests for hemolytic streptococci, 134 guinea pig inoculations for tubercle bacilli and 68 agglutination tests for paratyphoid fever.

Typhoid Deaths, 1917-26, classified by Age Groups.

YEAR.	0-14.		15-39.		40 PLUS.		Total Deaths.	%
	D.	%	D.	%	D.	%		
1917	33	18.5	94	53.00	51	28.6	178	100
1918	18	11.0	102	64.0	40	25.0	160	100
1919	17	15.9	63	59.0	27	25.2	107	100
1920	15	15.8	51	53.7	29	30.5	95	100
1921	17	14.5	60	51.3	40	34.2	117	100
1922	11	12.8	50	58.2	25	29.0	86	100
1923	8	11.6	42	61.0	19	27.5	69	100
1924	9	13.2	32	47.0	27	39.7	68	100
1925	15	20.6	33	45.2	25	34.2	73	100
1926	9	14.8	33	54.1	19	31.1	61	100

Diphtheria.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.
1917-21 (av.)	8,357	218	647	16.9
1922	8,826	221	606	15.2
1923	9,018	223	579	14.3
1924	7,290	178	534	12.9
1925	4,482	108	333	8.0
1926	3,401	81	243	5.8

Diphtheria Cases, 1922-26, classified by Age Groups.

YEAR.	0-5.		6-14.		15 PLUS.		Total Age Given.	%
	C.	%	C.	%	C.	%		
1922	3,414	41.5	3,623	44.1	1,169	14.4	8,206	100
1923	3,440	40.5	3,917	46.0	1,158	13.5	8,515	100
1924	2,859	43.5	2,690	40.8	1,040	15.7	6,589	100
1925	1,776	43.5	1,629	40.0	670	16.5	4,075	100
1926	1,376	44.8	1,144	37.3	550	17.9	3,070	100

Diphtheria Deaths by Age Groups.

[Five Year Averages.]

YEAR.	0-4.		5-9.		10 PLUS.		Total.
	D.	%	D.	%	D.	%	
1917-1921	360	55.6	210	32.5	77	11.9	647
1922-1926	276	60.0	138	30.0	46	10.0	460

Smallpox.

YEAR.	Cases.	Deaths.
1917-21 (av.)	39	3
1922	2	—
1923	6	—
1924	12	2
1925	3	—
1926	4	—

Gonorrhea and Syphilis.

YEAR.	GONORRHEA.		SYPHILIS.			Death Rate per 100,000.
	Cases.	Case Rate per 100,000.	Cases.	Case Rate per 100,000.	Deaths.	
1918	7,681	197	3,284	84.4	280	7.2
1919	9,435	246	4,127	107.5	281	7.3
1920	7,225	188	2,987	77.6	224	5.8
1921	5,563	141	2,497	63.4	200	5.1
1922	4,973	125	1,933	48.4	213	5.3
1923	4,885	121	1,891	46.7	194	4.7
1924	5,241	128	2,325	56.7	176	4.2
1925	5,192	125	2,147	51.6	148	3.5
1926	4,920	117	1,904	45.1	160	3.8

It is peculiarly difficult in gonorrhea and syphilis to draw conclusions from case rates. It is impossible to state whether an increase in the number of cases reported means a greater incidence of the disease, or whether more and more people are availing themselves of ethical treatment. In the case of syphilis some conclusions can be drawn from the death rate. This rate has been steadily decreasing.

Distribution of Arsphenamine, Sulpharsphenamine and Bichloridol, by Years.

YEAR.	Arsphenamine. ¹	Sulpharsphenamine. ¹	Bichloridol. ²
1922	42,083	—	9,680
1923	42,843	3,737 ³	12,800
1924	27,603	18,864	13,412
1925	26,121	27,911	17,043
1926	21,726	31,895	9,486

Total Cases attending, and Visits to, State Subsidized Venereal Disease Clinics during 1924, 1925, 1926.

[Subsidized Clinics (16).]

YEAR.	New Cases.	Old Cases.	Total Visits.	Persons attending Clinic per 100,000 Population.
1924	5,132	5,188	155,671	4,187.66
1925	8,060	5,852	150,132	4,262.06
1926	9,851	5,194	128,188	5,117.74

Scarlet Fever.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Per Cent.
1917-21 (av.)	7,410	192	145	3.8	1.9
1922	7,868	197	149	3.7	1.9
1923	12,300	304	155	3.8	1.3
1924	14,410	351	158	3.9	1.1
1925	10,319	248	117	2.8	1.1
1926	11,323	268	113	2.7	1.0

Scarlet fever for the past twenty-one years has been increasing at the rate of over two hundred and thirty cases per year. However, the death rate and fatality rate have steadily declined. For example, in 1876 the deaths from this disease were 1,222 giving a mortality rate of 73.0. For 1926, just fifty years later, the mortality rate was 2.7.

Tuberculosis, Pulmonary.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Per Cent.
1917-21 (av.)	7,207	188	4,214	110.0	58
1922	5,562	139	3,167	79.3	57
1923	5,356	132	3,062	75.7	57
1924	5,376	131	2,953	71.9	55
1925	5,385	130	2,883	69.3	54
1926	5,491	130	2,952	70.0	54

During the past quinquennium, the number of cases of pulmonary tuberculosis reported yearly has remained about constant, although previous to that time there had been a very definite decrease in incidence. Fortunately, the fatality rate for this same period has been steadily decreasing. To a less extent the same facts hold true for non-pulmonary tuberculosis.

¹ Based on 0.6 gram doses.

² Collapsules.

³ June to December.

Tuberculosis, Non-Pulmonary.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Per Cent.
1917-21 (av.)	786	20.4	699	18.1	89
1922	817	20.5	569	14.3	70
1923	807	19.9	528	13.0	65
1924	893	23.0	577	13.9	61
1925	825	19.8	576	13.7	70
1926	891	21.1	527	12.5	60

Lobar Pneumonia.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.
1918 ¹	13,374	351	10,339	271.7
1919	4,585	119	2,614	65.5
1920	5,558	143	2,842	73.8
1921	4,080	104	1,823	46.3
1922	5,194	130	2,344	58.7
1923	4,759	118	2,313	57.2
1924	4,552	111	1,944	47.4
1925	5,544	133	2,364	56.0
1926	5,134	122	2,378	56.4

After a sharp drop in the number of cases after 1918, the case incidence has remained fairly constant to date.

Measles.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.
1917-21 (av.)	22,609	589	323	8.4
1922	23,291	583	218	5.5
1923	26,854	664	321	7.9
1924	22,425	547	165	4.0
1925	28,816	693	337	8.1
1926	30,020	712	367	8.7

Whooping Cough.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.
1917-21 (av.)	6,613	171	408	10.6
1922	6,823	171	294	7.4
1923	10,612	262	493	12.2
1924	4,062	99	147	3.6
1925	8,077	194	269	6.5
1926	11,547	274	404	9.6

Whooping cough became a reportable disease in 1907. The incidence has been increasing. During the past year more cases were reported than in any other year since the disease was made reportable.

¹ Made reportable May, 1917.

Cases and Deaths from Certain Communicable Diseases in Massachusetts from 1922 to 1926.

	1922.		1923.		1924.		1925.		1926.	
Population	3,991,333		4,046,923		4,102,513		4,158,103		4,213,693	
DISEASE.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Actinomycosis	3	2	6	4	4	2	3	1	2	1
Anterior Poliomyelitis	217	33	223	35	227	27	167	52	245	44
Anthrax	3	1	7	2	11	2	5	1	13	1
Chicken Pox	5,177	8	7,983	11	5,985	9	7,516	9	8,284	7
Dog Bite	181	—	252	—	208	—	186	—	169	—
Dysentery	14	10	3	2	25	3	13	5	8	8
Encephalitis Lethargica	163	83	180	85	106	58	146	99	105	78
Epidemic Cerebrospinal Meningitis	105	47	121	41	128	39	112	35	116	43
German Measles	480	2	527	—	1,644	3	6,778	3	6,236	3
Influenza	7,453	569	2,466	742	405	277	1,244	519	2,193	736
Malaria	48	4	23	3	36	2	11	6	22	1
Mumps	4,358	2	7,707	6	9,431	12	2,674	6	5,117	1
Ophthalmia Neonatorum ¹	1,219	—	1,480	—	1,820	—	1,988	—	1,832	—
Pellagra	15	9	16	11	18	12	19	10	16	10
Septic Sore Throat	123	25	197	27	170	47	116	29	129	35
Tetanus	96	21	28	18	41	23	45	35	30	22
Trachoma	19	—	62	—	55	—	75	—	53	—
Trichinosis	19	4	13	—	40	1	26	—	13	—
Glanders	—	—	—	—	—	—	—	—	—	—
Hookworm	42	—	12	—	18	—	23	—	8	—
Leprosy	1	—	1	—	—	—	—	—	1	—
Rabies	2	5	3	1	1	1	2	3	—	—
Typhus Fever	—	—	1	—	—	—	2	—	—	—

¹ Includes suppurative conjunctivitis.

Cases and Deaths, with Case and Death Rates per 100,000 Population for All Reportable Diseases during the Year 1926.

DISEASE.	Cases.	Case Rate per 100,000 Population.	Deaths.	Death Rate per 100,000 Population.	Fatality Rate (Per Cent) . .
Actinomycosis	2	.04	1	.02	50.0
Anterior Poliomyelitis	245	5.8	44	1.0	18.0
Anthrax	13	.3	1	.02	7.7
Chicken Pox	8,284	196.6	7	.2	.1
Diphtheria	3,401	80.7	243	5.8	7.1
Dog Bite	169	4.0	—	—	—
Dysentery	8	.2	8	.2	100.0
Encephalitis Lethargica	105	2.5	78	1.8	74.3
Epidemic Cerebrospinal Meningitis	116	2.8	43	1.0	37.1
German Measles	6,236	147.9	3	.1	.04
Gonorrhea	4,920	116.8	14	.3	.3
Hookworm	8	.2	—	—	—
Influenza	2,193	52.0	736	17.5	33.6
Leprosy	1	.02	—	—	—
Malaria	22	.5	1	.02	4.5
Measles	30,020	712.4	367	8.7	1.2
Mumps	5,117	121.4	1	.02	.01
Ophthalmia Neonatorum ¹	1,832	43.5	—	—	—
Pellagra	16	.4	10	.2	62.5
Pneumonia, Lobar	5,134	121.8	2,380	56.5	46.4
Scarlet Fever	11,323	268.7	113	2.7	1.0
Septic Sore Throat	129	3.1	35	.8	27.1
Smallpox	4	.1	—	—	—
Syphilis	1,904	45.2	160	3.8	8.4
Tetanus	30	.7	22	.5	73.3
Trachoma	53	1.3	—	—	—
Trichinosis	13	.3	—	—	—
Tuberculosis, Pulmonary	5,444	129.2	2,952	70.0	54.2
Tuberculosis, Other Forms	874	20.7	527	12.5	60.3
Tuberculosis, Hilum	665	15.8	—	—	—
Typhoid Fever	547	12.9	61	1.4	10.6
Whooping Cough	11,547	274.0	404	9.6	3.5
Total	100,375	2,382.1	8,211	194.7	8.2

¹ Includes 369 cases of suppurative conjunctivitis.

Cases and Deaths from Communicable Diseases by Months, 1926.

	JAN- UARY.		FEB- RUARY.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUGUST.		SEP- TEMBER.		OCTOBER.		NO- VEMBER.		DE- CEMBER.		TOTAL.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Actinomycosis	6	-	4	-	5	2	3	4	2	1	5	2	21	7	75	13	59	6	27	5	26	3	8	2	245	44
Anterior Poliomyelitis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-
Anthrax	1145	1	826	1	5	-	440	2	1	1	708	-	364	-	102	1	107	1	420	2	2	1	2	8	245	44
Chicken Pox	391	23	273	22	304	24	228	24	205	14	276	19	174	9	127	7	209	17	291	16	418	29	505	39	8284	7
Diphtheria	13	-	18	-	14	-	14	-	6	2	12	-	10	-	21	-	11	-	6	-	7	-	39	-	3401	243
Dog Bite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-
Dysentery	5	5	14	10	13	15	8	9	10	1	11	2	11	7	2	2	2	1	1	2	3	3	1	1	8	8
Epidemic Cerebrospinal Meningitis	6	6	18	4	18	7	13	3	9	3	9	3	8	5	2	2	11	5	7	1	3	3	3	1	105	78
German Measles	251	1	478	2	1067	-	1295	3	1762	1	1023	3	190	3	35	1	20	1	33	7	36	3	46	3	6236	3
Gonorrhea	367	-	355	-	334	-	382	3	433	1	384	3	458	1	474	3	467	1	377	1	561	-	328	1	4920	14
Hookworm	3	-	4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-
Influenza	57	52	50	52	1172	198	625	234	74	53	25	22	9	7	10	8	30	17	38	31	46	26	57	36	2193	736
Leprosy	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Malaria	1	-	-	-	1	70	3776	51	3187	1	2	2	4	51	83	2	17	1	2	1	1	1	1	1	22	1
Measles	6573	87	6441	73	5490	1	518	2	627	38	2724	17	917	15	203	5	79	2	120	1	161	4	358	4	30020	367
Mumps	343	-	347	-	518	-	471	-	1600	1	600	-	242	-	149	-	142	-	269	-	599	-	810	-	5117	1
Ophthalmia Neonatorum	136	-	151	-	177	-	162	-	142	-	142	-	150	-	148	-	134	-	161	-	148	-	134	-	1832	-
Pellagra	1	1	1	1	1	-	-	-	1	1	2	2	4	-	3	2	2	-	1	1	1	2	1	1	16	10
Pneumonia, Lobar	759	320	499	216	953	475	933	438	456	209	302	107	136	51	83	47	137	68	201	105	265	127	410	217	5134	2380
Rabies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scarlet Fever	1289	10	1119	9	1194	14	1103	13	956	9	927	15	628	10	295	7	353	4	729	4	1191	9	1539	9	11323	113
Septic Sore Throat	11	5	13	-	12	8	11	3	9	6	6	2	12	4	12	5	7	2	8	1	10	2	18	3	129	35
Smallpox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
Syphilis	159	-	159	15	182	20	170	17	169	12	168	14	158	8	158	14	138	14	138	8	192	10	113	11	1904	160
Tetanus	1	1	2	-	2	2	2	2	2	2	2	2	9	6	6	6	4	3	1	1	1	1	1	2	30	22
Trachoma	8	-	3	-	3	-	-	-	5	-	-	-	-	-	4	-	5	-	3	1	7	-	4	-	53	-
Trichinosis	1	-	2	-	-	-	-	-	-	-	3	-	1	-	1	-	1	-	-	-	-	-	-	-	13	-
Tuberculosis, Pulmonary	426	267	383	230	477	287	568	308	566	320	522	264	494	245	444	231	390	188	394	205	386	212	394	195	5444	2952
Tuberculosis, Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tuberculosis, Forms	55	35	63	43	85	48	84	49	86	52	89	43	65	47	78	41	76	35	69	43	58	40	66	51	874	527
Tuberculosis Hilum	93	-	69	-	86	-	55	-	84	-	39	-	55	-	26	-	25	-	61	-	51	-	47	-	665	-
Typhoid Fever	27	5	22	3	20	3	22	4	30	5	34	3	46	5	73	4	49	7	86	12	43	4	95	6	547	61
Whooping Cough	1683	31	1653	44	2179	104	1376	64	1104	49	776	20	599	23	430	13	379	13	322	19	442	11	604	13	11547	404

Index to Line Numbers in the Table of Cases and Deaths from Diseases Dangerous to the Public Health, 1926.

Abington	120	Dunstable	342	Lexington	93
Acton	192	Duxbury	229	Leyden	350
Acushnet	139			Lincoln	259
Adams	65	East Bridgewater	151	Littleton	252
Agawam	110	East Brookfield	286	Longmeadow	153
Alford	354	East Longmeadow	157	Lowell	11
Amesbury	74	Eastham	321	Ludlow	88
Amherst	117	Easthampton	72	Lunenburg	215
Andover	76	Easton	124	Lynn	12
Arlington	34	Edgartown	267	Lynnfield	258
Ashburnham	204	Egremont	324		
Ashby	290	Enfield	303	Malden	20
Ashfield	287	Erving	260	Manchester	188
Ashland	186	Essex	256	Mansfield	106
Athol	83	Everett	30	Marblehead	91
Attleboro	44			Marion	265
Auburn	126	Fairhaven	73	Marlborough	51
Avon	195	Fall River	8	Marshfield	218
Ayer	171	Falmouth	133	Mashpee	344
		Fitchburg	26	Mattapoisett	233
Barnstable	119	Florida	336	Maynard	97
Barre	156	Foxborough	129	Medfield	147
Becket	298	Framingham	42	Medford	22
Bedford	242	Franklin	100	Medway	163
Belchertown	167	Freetown	231	Melrose	45
Bellingham	168			Mendon	281
Belmont	52	Gardner	48	Merrimac	198
Berkley	273	Gay Head	358	Methuen	43
Berlin	276	Georgetown	220	Middleborough	86
Bernardston	292	Gill	288	Middlefield	355
Beverly	40	Gloucester	38	Middleton	227
BillERICA	125	Goshen	349	Millford	59
Blackstone	134	Gosnold	359	Millbury	109
Blandford	330	Grafton	101	Millis	219
Bolton	294	Granby	297	Millville	196
Boston	3	Granville	312	Milton	64
Bourne	166	Great Barrington	112	Monroe	362
Boxborough	341	Greenfield	58	Monson	127
Boxford	313	Greenwich	325	Montague	96
Boylston	283	Groton	190	Monterey	338
Braintree	63	Groveland	191	Montgomery	357
Brewster	299			Mount Washington	365
Bridgewater	81	Hadley	175		
Brimfield	293	Halifax	310	Nahant	230
Brockton	16	Hamilton	206	Nantucket	162
Brookfield	254	Hampden	308	Natick	67
Brookline	27	Hancock	317	Needham	84
Buckland	235	Hanover	181	New Ashford	364
Burlington	240	Hanson	203	New Bedford	10
		Hardwick	170	New Braintree	329
Cambridge	9	Harvard	309	New Marlborough	284
Canton	121	Harwich	205	New Salem	317
Carlisle	318	Hatfield	184	Newbury	248
Carver	255	Haverhill	24	Newburyport	57
Charlemont	296	Hawley	339	Newton	19
Charlton	199	Heath	345	Norfolk	270
Chatham	228	Hingham	115	North Adams	39
Chelmsford	104	Hinsdale	282	North Andover	102
Chelsea	23	Holbrook	159	North Attleborough	79
Cheshire	216	Holden	152	North Brookfield	165
Chester	238	Holland	361	North Reading	226
Chesterfield	326	Holliston	180	Northampton	37
Chicopee	28	Holyoke	18	Northborough	211
Chilmark	351	Hopedale	161	Northbridge	77
Clarksburg	268	Hopkinton	185	Northfield	223
Clinton	62	Hubbardston	280	Norton	176
Cohasset	173	Hudson	92	Norwell	245
Colrain	241	Hull	177	Norwood	61
Concord	99	Huntington	236		
Conway	289			Oak Bluffs	257
Cummington	320	Ipswich	118	Oakham	314
				Orange	131
Dalton	141	Kingston	187	Orleans	278
Dana	305			Otis	332
Danvers	70	Lakeville	251	Oxford	143
Dartmouth	82	Lancaster	183		
Dedham	60	Lanesborough	271	Palmer	75
Deerfield	172	Lawrence	15	Paxton	311
Dennis	224	Lee	145	Peabody	46
Dighton	155	Leicester	140	Pelham	315
Douglas	194	Lenox	174	Pembroke	244
Dover	279	Leominster	41	Pepperell	178
Dracut	107	Leverett	306	Peru	363
Dudley	135				

Petersham	304	Shutesbury	356	Wareham	122
Phillipston	334	Somerset	128	Warren	144
Pittsfield	25	Somerville	13	Warwick	337
Plainfield	348	South Hadley	103	Washington	352
Plainville	243	Southampton	285	Watertown	35
Plymouth	68	Southborough	207	Wayland	201
Plympton	319	Southbridge	55	Webster	66
Prescott	353	Southwick	264	Wellesley	80
Princeton	300	Spencer	108	Wellfleet	302
Provincetown	149	Springfield	7	Wendell	331
		Sterling	237	Wenham	274
Quincy	17	Stockbridge	222	West Boylston	213
		Stoneham	85	West Bridgewater	164
Randolph	123	Stoughton	94	West Brookfield	261
Raynham	202	Stow	272	West Newbury	262
Reading	89	Sturbridge	217	West Springfield	56
Rehoboth	197	Sudbury	249	West Stockbridge	266
Revere	33	Sunderland	263	West Tisbury	343
Richmond	307	Sutton	208	Westborough	111
Rochester	277	Swampscott	87	Westfield	47
Rockland	95	Swansea	154	Westford	150
Rockport	146			Westhampton	340
Rowe	346	Taunton	31	Westminster	212
Rowley	250	Templeton	138	Weston	169
Royalston	295	Tewksbury State Infirmary	366	Westport	137
Russell	253	Tewksbury	130	Westwood	225
Rutland	200	Tisbury	247	Weymouth	50
		Tolland	360	Whately	269
Salem	29	Topsfield	291	Whitman	98
Salisbury	221	Townsend	214	Wilbraham	179
Sandisfield	323	Truro	322	Williamsburg	210
Sandwich	246	Tyngsborough	275	Williamstown	142
Saugus	69	Tyringham	347	Wilmington	148
Savoy	333			Winchendon	116
Scituate	182	Upton	209	Winchester	71
Seekonk	136	Uxbridge	113	Windsor	335
Sharon	160			Winthrop	53
Sheffield	232	Wakefield	54	Woburn	49
Shelburne	239	Wales	327	Worcester	5
Sherborn	301	Walpole	105	Worthington	328
Shirley	193	Waltham	32	Wrentham	158
Shrewsbury	114	Ware	90	Yarmouth	234

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1926.	22		25A		10		24		25B		40	
			Anterior Polio- mye- litis.	Chicken Pox.	Diph- theria.	Epi- Cere- bro- spinal Menin- gitis.	Ger- man Meas- les.	Gonor- rhea.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	Massachusetts	4,213,693	245	44	8284	7	3401	243	116	43	6236	3	4920	14
2	CITIES OF OVER 500,000.													
3	Boston	787,134	13	7	2113	4	897	54	38	26	2039	1	2630	1
4	CITIES OF OVER 150,000.													
5	Worcester	193,376	35	7	343	-	288	17	6	1	723	-	276	-
6	CITIES 100,000-150,000.	831,406	65	9	1841	-	609	68	22	6	522	-	858	9
7	Springfield	145,029	41	4	302	-	48	6	3	3	39	-	287	3
8	Fall River	131,018	5	2	97	-	150	18	6	2	7	-	88	1
9	Cambridge	122,044	4	-	491	-	49	1	5	-	293	-	137	3
10	New Bedford	119,140	-	-	111	-	116	18	-	-	16	-	65	2
11	Lowell	109,711	5	2	83	-	74	6	1	-	11	-	141	-
12	Lynn	104,017	3	-	105	-	90	9	5	1	32	-	102	-
13	Somerville	100,447	7	1	152	-	82	10	2	-	124	-	38	-
14	CITIES 50,000-100,000.	389,676	23	3	641	-	283	33	9	3	367	1	169	1
15	Lawrence	93,352	1	1	125	-	57	8	4	1	1	-	75	1
16	Brockton	65,127	8	-	149	-	9	1	2	-	27	-	35	-
17	Quincy	62,955	2	-	113	-	52	3	1	-	44	-	14	-
18	Holyoke	61,056	1	1	41	-	110	14	1	-	4	-	22	-
19	Newton	54,658	9	-	160	-	15	1	-	-	221	1	5	-
20	Malden	52,428	2	1	53	-	40	6	1	2	70	-	18	-
21	CITIES AND TOWNS, 25,000-50,000.	673,447	30	3	1079	2	680	35	11	1	546	-	468	1
22	Medford	49,672	2	1	144	1	25	2	2	-	259	-	16	-
23	Chelsea	48,213	1	-	74	-	31	2	1	1	2	-	22	-
24	Haverhill	48,125	3	-	162	-	87	3	1	-	13	-	179	-
25	Pittsfield	48,093	8	2	41	-	34	2	3	-	5	-	36	-
26	Fitchburg	44,223	3	-	13	-	38	5	1	-	4	-	16	-
27	Brookline	43,856	2	-	126	-	8	-	-	-	165	-	13	-
28	Chicopee	43,231	1	-	10	-	53	6	-	-	4	-	3	-
29	Salem	42,890	1	-	38	-	154	13	1	-	8	-	60	1
30	Everett	42,536	2	-	24	-	40	-	2	-	12	-	43	-
31	Taunton	39,759	1	-	6	-	9	1	-	-	1	-	17	-
32	Waltham	35,658	1	-	78	-	20	1	-	-	22	-	35	-
33	Revere	34,317	2	-	28	-	100	-	-	-	15	-	8	-
34	Arlington	26,437	2	-	305	-	12	-	-	-	31	-	19	-
35	Watertown	26,437	1	-	30	1	9	-	-	-	5	-	254	1
36	CITIES AND TOWNS, 10,000-25,000.	668,442	47	12	1521	1	405	19	22	4	1030	1	38	-
37	Northampton	24,667	1	-	25	-	13	1	1	1	31	-	10	-
38	Gloucester	23,475	-	-	7	-	25	-	1	-	3	-	10	-
39	North Adams	22,821	-	-	4	-	13	-	-	-	-	-	10	-
40	Beverly	22,714	-	-	20	1	47	1	-	-	15	-	23	-
41	Leominster	22,685	5	1	25	-	32	5	2	1	13	-	68	-
42	Framingham	22,041	-	-	33	-	8	-	-	-	31	-	-	-
43	Methuen	21,895	-	-	84	-	11	1	-	-	36	-	-	-
44	Attleboro	20,834	1	-	59	-	9	-	2	-	57	1	8	-
45	Melrose	20,631	7	3	81	-	7	-	3	1	118	-	8	-
46	Peabody	19,945	1	-	33	-	17	-	1	-	3	-	6	-
47	Westfield	19,517	1	1	16	-	8	-	2	-	-	-	2	-
48	Gardner	19,149	7	1	3	-	-	-	-	-	-	-	24	-
49	Woburn	18,798	4	1	7	-	5	2	-	-	-	-	-	-
50	Weymouth	17,775	-	-	13	-	5	-	-	-	-	-	-	-
51	Marlborough	16,522	-	-	30	-	1	-	-	-	26	-	5	-
52	Belmont	16,329	-	-	103	-	6	-	-	-	64	-	6	-
53	Winthrop	16,324	-	-	20	-	4	-	-	-	94	-	4	-
54	Wakefield	16,226	-	1	19	-	25	-	-	-	41	-	2	-
55	Southbridge	15,784	4	2	-	-	15	-	-	-	2	-	4	-
56	West Springfield	15,773	1	-	18	-	5	-	1	-	-	-	1	-
57	Newburyport	15,665	-	-	31	-	3	-	2	-	12	-	1	-
58	Greenfield	15,195	5	2	350	-	6	1	-	-	41	-	6	-
59	Milford	15,091	1	-	11	-	5	-	3	-	1	-	-	-
60	Dedham	14,662	-	-	31	-	21	1	-	-	37	-	-	-
61	Norwood	14,512	-	-	11	-	11	-	-	-	6	-	3	-
62	Clinton	14,465	-	-	43	-	5	-	2	1	19	-	-	-
63	Braintree	13,814	-	-	49	-	1	-	-	-	53	-	2	-
64	Milton	13,689	-	-	42	-	5	-	-	-	88	-	-	-
65	Adams	13,657	-	-	6	-	3	-	-	-	-	-	-	-
66	Webster	13,419	2	-	21	-	8	-	-	-	108	-	-	-
67	Natick	13,337	-	-	23	-	3	1	-	-	8	-	-	-
68	Plymouth	13,206	1	-	54	-	4	-	-	-	3	-	1	-
69	Saugus	13,187	2	-	10	-	3	-	1	-	11	-	-	-
70	Danvers	11,962	1	-	32	-	15	-	-	-	28	-	1	-
71	Winchester	11,821	1	-	54	-	7	1	-	-	43	-	4	-
72	Easthampton	11,663	-	-	6	-	12	-	1	-	1	-	-	-
73	Fairhaven	11,568	-	-	52	-	6	1	-	-	4	-	2	-
74	Amesbury	11,513	-	-	14	-	2	-	-	-	3	-	14	1
75	Palmer	11,317	1	-	10	-	23	3	-	-	-	-	1	-

11	101	7	13	40A	8	38	31	32-37	1	9												
Influenza.	Lobar Pneumonia.	Measles.	Mumps.	Ophthalmia Neonatorum.	Scarlet Fever.	Syphilis.	Tuberculosis, Pulmonary.	Tuberculosis, Other Forms.	Typhoid Fever.	Whooping Cough.	Line No.											
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.											
2193	736	5134	2380	30020	367	5117	1	1832	-	11323	113	1904	160	5444	2952	874	527	547	61	11547	404	1
408	75	1570	592	4321	60	1581	-	1099	-	2798	38	944	64	1843	670	285	109	106	15	3551	110	2
108	19	319	156	1035	17	54	-	126	-	476	4	178	13	268	130	52	36	1	365	11	5	3
362	139	994	383	5697	114	673	-	241	-	2520	21	322	21	1117	528	268	127	113	18	2026	74	6
49	25	181	69	2156	30	43	-	16	-	197	3	128	5	151	72	32	22	5	1	336	10	7
95	23	119	59	832	34	116	-	63	-	114	1	31	6	211	121	23	25	21	1	214	18	8
100	5	250	71	741	3	356	1	19	-	338	2	46	1	204	97	38	13	17	6	779	17	9
19	43	110	42	678	22	36	-	113	-	462	5	34	2	199	96	98	27	11	1	118	13	10
26	9	66	34	227	10	6	-	10	-	302	3	67	2	114	67	40	28	14	4	66	3	11
14	14	133	57	504	7	69	-	7	-	611	3	8	3	139	42	19	9	34	4	332	9	12
59	20	135	51	559	8	47	-	13	-	496	4	8	2	99	33	18	3	11	1	181	4	13
52	47	319	178	3494	16	841	-	246	-	826	10	145	4	376	155	69	47	50	5	890	19	14
4	6	38	21	69	2	34	-	94	-	119	2	68	1	79	34	14	10	26	1	97	3	15
2	4	8	79	28	83	2	85	129	-	106	1	57	-	78	20	4	5	5	-	158	2	16
10	9	43	29	204	1	141	-	3	-	249	3	5	2	68	25	17	4	8	-	63	3	17
11	9	63	30	1630	2	550	-	2	-	152	1	2	-	39	16	8	6	4	3	296	1	18
25	8	67	29	351	3	31	-	17	-	173	3	2	-	59	16	10	4	4	-	253	11	20
261	108	721	341	3330	43	635	-	48	-	1717	9	103	22	662	278	79	60	62	4	1416	49	21
26	8	59	18	376	2	127	-	3	-	175	1	3	-	65	18	6	2	13	1	253	7	22
22	9	93	33	199	-	15	-	6	-	143	1	6	3	76	51	1	7	10	1	58	2	23
74	11	131	32	147	2	168	-	9	-	103	2	31	1	59	17	8	3	3	-	77	1	24
23	15	47	44	166	1	14	-	245	-	11	1	1	1	58	30	6	11	5	-	11	25	25
18	2	69	42	589	10	16	-	4	-	26	-	7	2	36	28	6	4	6	1	15	5	26
5	7	39	16	325	-	88	-															

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1926.	22 An- terior Poli- omye- litis.		25A Chicken Pox.		10 Diph- theria.		24 Ep. Cere- bro- spinal Menin- gitis.		25B Ger- man Meas- les.		40 Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
76	Andover	10,772	-	-	59	-	1	-	-	-	29	-	-	-
77	Northbridge	10,022	1	-	12	-	5	1	-	-	-	-	1	-
78	Towns, 5,000-10,000.	380,721	12	1	705	-	187	11	6	-	477	-	151	1
79	North Attleborough	9,920	1	-	14	-	8	-	-	-	7	-	-	-
80	Wellesley	9,721	-	-	31	-	1	-	-	-	61	-	-	-
81	Bridgewater	9,713	-	-	66	-	-	-	-	-	25	-	9	-
82	Dartmouth	9,629	-	-	8	-	-	-	-	-	1	-	-	-
83	Athol	9,557	-	-	5	-	21	2	1	-	3	-	4	-
84	Needham	9,443	-	-	65	-	-	-	-	-	33	-	1	-
85	Stoneham	9,372	-	-	20	-	2	-	-	-	1	-	-	-
86	Middleborough	9,298	3	-	29	-	-	-	-	-	66	-	-	-
87	Swampscott	9,156	-	-	111	-	5	-	1	-	39	-	-	-
88	Ludlow	9,118	1	-	6	-	14	1	-	-	1	-	1	-
89	Reading	8,992	-	-	-	-	1	-	1	-	4	-	-	-
90	Ware	8,653	-	-	8	-	2	1	-	-	1	-	-	-
91	Marblehead	8,425	-	-	3	-	3	-	-	-	28	-	5	-
92	Hudson	8,255	-	-	-	-	-	-	-	-	-	-	-	-
93	Lexington	8,125	-	-	25	-	5	-	-	-	11	-	-	-
94	Stoughton	8,092	-	-	-	-	1	-	1	-	-	-	-	-
95	Rockland	8,065	-	-	2	-	-	-	-	-	1	-	-	-
96	Montague	8,043	-	-	1	-	-	-	-	-	2	-	-	-
97	Maynard	8,040	-	-	5	-	-	-	-	-	2	-	-	-
98	Whitman	8,025	-	-	5	-	-	-	-	-	-	-	-	-
99	Concord	7,197	-	-	33	-	-	-	-	-	6	-	111	-
100	Franklin	7,187	-	-	14	-	2	-	-	-	3	-	5	-
101	Grafton	6,993	-	-	-	-	-	-	-	-	-	-	-	-
102	North Andover	6,975	-	-	25	-	3	-	-	-	16	-	-	-
103	South Hadley	6,865	-	-	15	-	6	-	-	-	5	-	-	-
104	Chelmsford	6,784	-	-	40	-	3	-	-	-	12	-	-	-
105	Walpole	6,760	-	-	11	-	9	1	1	-	1	-	7	-
106	Mansfield	6,670	-	-	8	-	-	-	-	-	5	-	2	-
107	Dracut	6,665	-	-	-	-	-	-	-	-	-	-	-	-
108	Spencer	6,664	1	-	-	-	24	1	-	-	-	-	-	-
109	Millbury	6,629	1	-	9	-	-	-	-	-	41	-	-	-
110	Agawam	6,591	-	-	-	-	-	-	-	-	-	-	-	-
111	Westborough	6,480	2	-	34	-	-	-	1	-	2	-	1	-
112	Great Barrington	6,426	-	-	3	-	38	1	-	-	17	-	-	1
113	Uxbridge	6,360	-	-	1	-	-	-	-	-	4	-	-	-
114	Shrewsbury	6,322	-	-	-	-	1	2	-	-	1	-	-	-
115	Hingham	6,288	-	-	11	-	-	-	-	-	5	-	-	-
116	Winchendon	6,236	1	-	3	-	3	1	-	-	13	-	-	-
117	Amherst	6,071	-	-	16	-	2	-	-	-	1	-	3	-
118	Ipswich	6,020	-	-	12	-	7	-	-	-	10	-	-	-
119	Barnstable	5,996	-	-	2	-	1	-	-	-	-	-	-	-
120	Abington	5,905	-	-	-	-	-	-	-	-	3	-	1	-
121	Canton	5,886	-	-	21	-	5	-	-	-	3	-	1	-
122	Wareham	5,874	-	1	2	-	2	-	-	-	-	-	-	-
123	Randolph	5,854	-	-	14	-	1	-	-	-	3	-	-	-
124	Easton	5,402	-	-	11	-	1	-	-	-	1	-	-	-
125	Billerica	5,214	-	-	6	-	3	1	-	-	16	-	-	-
126	Auburn	5,173	2	-	3	-	5	-	-	-	23	-	-	-
127	Monson	5,150	-	-	-	-	-	-	-	-	-	-	-	-
128	Somerset	5,127	-	-	3	-	6	-	-	-	-	-	-	-
129	Foxborough	5,123	-	-	-	-	-	-	-	-	-	-	-	-
130	Tewksbury	5,111	-	-	4	-	1	-	-	-	-	-	-	-
131	Orange	5,081	-	-	-	-	1	-	-	-	-	-	-	-
132	Towns, 2,500-5,000.	191,868	9	2	184	-	70	6	1	1	183	-	45	-
133	Falmouth	4,978	-	-	4	-	-	-	-	-	-	-	2	-
134	Blackstone	4,921	2	-	-	-	-	-	-	-	-	-	-	-
135	Dudley	4,805	4	1	5	-	3	1	-	-	-	-	-	-
136	Seekonk	4,499	-	-	-	-	-	-	-	-	-	-	-	-
137	Westport	4,467	-	-	-	-	3	1	-	-	1	-	-	-
138	Templeton	4,451	-	-	7	-	1	-	-	-	1	-	-	-
139	Acushnet	4,387	-	-	2	-	10	4	-	-	-	-	-	-
140	Leicester	4,223	-	-	-	-	2	-	-	-	-	-	-	-
141	Dalton	4,172	-	-	-	-	-	-	-	-	-	-	-	-
142	Williamstown	4,076	-	-	1	-	3	-	-	-	3	-	-	-
143	Oxford	4,074	-	-	1	-	4	-	-	-	-	-	1	-
144	Warren	4,064	-	-	14	-	-	-	-	-	1	-	-	-
145	Lee	4,052	-	-	-	-	-	-	-	-	-	-	-	-
146	Rockport	3,965	-	-	3	-	-	-	-	-	3	-	-	-
147	Medfield	3,932	-	-	-	-	-	-	-	-	-	-	-	-
148	Wilmington	3,737	-	-	-	-	9	-	-	-	-	-	-	-
149	Provincetown	3,679	-	-	1	-	-	-	-	-	1	-	-	-

to the Public Health, 1926 — Continued.

11		101		7		13		40A		8		38		31		32-37		1		9		Line No.
Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
4	4	14	8	43	-	169	-	-	-	53	1	-	-	2	2	2	-	1	-	18	-	76
22	2	17	6	286	-	5	-	-	-	12	-	-	-	11	5	-	-	2	-	20	-	77
88	75	253	170	3828	19	196	-	17	-	814	9	55	7	307	189	53	35	41	3	772	51	78
-	-	2	9	3	238	-	5	-	-	10	-	-	-	12	4	1	-	-	-	44	1	79
-	-	3	19	6	409	-	17	-	3	19	-	1	-	4	1	-	-	-	-	19	1	80
-	-	2	19	5	194	1	11	-	-	10	-	6	2	59	13	2	1	1	52	2	81	
1	-	3	1	122	-	-	-	3	-	43	-	-	-	9	4	7	2	-	-	18	-	82
-	-	8	2	2	4	-	-	-	-	14	1	-	-	4	2	-	-	-	-	6	-	83
-	-	6	5	301	-	10	-	-	-	56	-	1	-	8	2	-	2	-	-	67	-	84
-	-	1	12	8	23	2	-	-	-	27	-	-	-	7	4	1	1	3	-	36	2	85
-	-	-	7	3	167	3	-	-	-	6	-	-	-	9	3	1	-	-	-	23	3	86
-	-	5	1	111	-	30	-	1	-	64	1	-	-	5	5	1	-	3	1	36	-	87
-	-	6	3	130	4	1	-	1	-	4	-	2	-	12	4	-	1	1	-	68	3	88
-	-	-	4	24	1	-	-	-	-	14	-	-	-	5	3	-	-	-	-	-	4	89
-	-	3	6	47	1	-	-	-	-	-	-	-	-	3	4	-	2	-	-	-	-	90
-	-	2	2	6	108	-	2	-	-	14	-	-	-	5	4	-	1	1	-	6	2	91
2	5	3	2	7	11	-	-	-	-	19	3	-	-	12	4	-	1	-	-	1	3	92
-	-	3	1	129	1	4	-	1	-	41	-	1	-	13	6	-	2	1	-	49	-	93
-	-	1	1	6	21	1	45	-	-	13	-	-	-	7	3	3	1	1	-	4	-	94
1	5	-	6	2	-	-	-	-	-	8	-	-	-	-	6	3	-	1	-	13	-	95
-	-	1	2	69	1	-	-	-	-	-	-	2	-	-	3	-	-	-	-	1	1	96
-	-	4	4	1	-	1	-	-	-	10	-	-	-	5	2	-	-	-	-	9	1	97
19	2	4	1	148	-	9	-	-	-	12	-	41	-	7	2	6	1	15	-	24	1	98
-	-	1	10	3	99	3	-	1	-	41	-	-	-	2	1	-	-	-	-	6	1	99
-	-	1	7	-	-	-	-	-	-	1	-	-	1	6	1	-	2	-	-	28	1	100
-	-	3	1	-	-	4	-	-	-	21	-	-	-	1	-	-	2	-	-	-	-	101
1	-	-	2	129	1	-	-	-	-	7	-	-	-	4	1	-	1	-	-	18	1	102
-	-	1	8	2	156	1	3	-	-	42	1	1	-	4	4	2	1	4	-	4	-	103
-	-	13	2	1	82	-	9	-	-	14	-	-	-	4	1	-	1	1	-	6	1	104
2	1	5	2	34	-	3	-	1	-	19	-	-	-	6	4	-	1	-	-	31	3	105
-	-	2	1	-	-	-	-	-	-	-	1	-	-	-	4	-	-	-	-	2	-	106
2	1	6	3	23	-	-	-	-	-	3	-	-	-	-	2	-	-	-	-	-	-	107
3	2	4	1	74	1	-	-	-	-	31	-	-	-	2	3	-	-	1	-	22	-	108
1	2	4	4	28	-	-	-	-	-	6	-	-	-	-	1	-	-	-	-	-	-	109
7	5	1	12	210	-	2	-	-	-	47	-	1	-	7	9	-	-	-	-	28	11	110
-	-	2	3	6	-	8	-	-	-	9	-	-	-	3	3	-	-	-	-	-	-	111
-	-	3	5	4	34	-	-	1	-	2	-	-	-	6	4	1	1	1	-	2	-	112
-	-	2	-	9	-	-	-	-	-	2	-	-	-	1	2	-	1	-	-	-	-	113
-	-	1	10	2	120	-	2	-	-	8	-	-	-	5	2	-	-	-	-	44	1	114
12	2	4	7	22	-	-	-	-	-	26	1	-	-	7	2	-	1	3	-	1	-	115
4	2	20	3	16	-	1	-	-	-	14	-	-	-	4	1	-	-	2	1	10	1	116
3	2	5	1	58	-	-	-	3	-	32	-	-	-	10	2	2	1	1	-	15	1	117
7	8	4	5	4	-	2	-	1	-	7	-	1	-	5	2	-	-	-	-	3	-	118
-	-	1	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	119
-	-	-	4	-	1	4	-	-	-	12	1	-	-	12	6	24	1	-	-	3	-	120
-	-	-	1	49	1	-	-	1	-	9	-	-	-	4	6	3	1	2	-	11	-	121
2	-	5	3	32	-	-	-	-	-	19	-	-	-	7	3	-	1	-	-	-	-	122
1	2	6	1	83	-	2	-	-	-	8	-	-	-	-	1	1	1	-	-	1	1	123
18	1	17	3	76	1	1	-	-	-	20	-	-	-	2	4	1	1	-	-	23	2	124
-	-	-	1	78	1	-	-	-	-	1	-	-	-	6	1	2	-	-	-	37	1	125
-	-	-	4	-	-	-	-	-	-	-	-	-	2	-	3	-	-	-	-	-	-	126
-	-	-	1	64	3	-	-	-	-	4	-	-	-	4	2	-	-	-	-	1	1	127
-	-	1	5	3	-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	128
-	-	-	-	23	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	129
-	-	3	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	130
375	57	75	100	1137	15	165	-	12	-	283	2	29	3	106	123	8	15	18	2	303	17	131
-	1	1	1	20	-	25	-	-	-	7	-	-	-	1	-	1	-	-	-	21	1	132
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	133
1	2	2	1	9	3	10	-	-	-	8	-	-	-	5	6	-	1	-	-	-	-	134
-	-	-	2	-	-	-	-	-	-	1	-	-	-	1	2	-	-	-	-	-	-	135
1	2	-	1	52	2	1	-	-	-	11	-	-	-	5	3	-	-	-	-	14	3	136
-	3	7	3	132	2	1	-	-	-	7	-	-	-	1	-	-	-	1	-	3	-	137
1	2	-	-	16	-	1	-	-	-	13	-	-	-	9	2	1	2	-	-	5	-	138
-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	139
-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	140
-	3	-	2	54	-	-	-	-	-	2	-	-	-	1	1	-	-	-	-	-	-	141
-	-	-	1	30	-	-	-	-	-	8	-	-	-	1	-	-	3	-	-	-	-	142
3	-	7	3	42	-	-	-	-	-	18	-	-	1	-	2	-	1	-	-	-	-	143
-	2	-	2	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	144
-	1	-	2	2	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	145
-	1	-	4	8	-	4	-	2	-	3	-	-	-	1	7	-	-	2	-	14	2	146
-	2	-	-	3	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	147
-	-	-	3	4	-	-	-	-	-	10	-	-	-	1	3	-	-	-	-	7	-	148
-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	5	-	149

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1926.	22 An- terior Polio- mye- litis.		25A Chicken Pox.		10 Diph- theria.		24 Ep. Cere- bro- spinal Menin- gitis.		25B Ger- man Mea- sles.		40 Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
150	Westford	3,666	1	-	-	-	1	-	-	-	1	-	-	-
151	East Bridgewater	3,550	-	-	-	-	-	-	-	-	-	-	-	-
152	Holden	3,546	-	-	7	-	1	-	-	-	65	-	3	-
153	Longmeadow	3,503	1	-	-	-	-	-	-	-	-	-	-	-
154	Swansea	3,468	-	-	-	-	-	-	-	-	-	-	-	-
155	Dighton	3,358	-	-	5	-	-	-	-	-	-	-	-	-
156	Barre	3,323	-	-	-	-	-	-	-	-	-	-	-	-
157	East Longmeadow	3,320	-	-	2	-	1	-	-	-	2	-	-	-
158	Wrentham	3,310	-	-	31	-	6	-	-	-	-	-	2	-
159	Holbrook	3,298	-	-	-	-	-	-	-	-	9	-	-	-
160	Sharon	3,274	-	-	1	-	3	-	-	-	-	-	-	-
161	Hopedale	3,256	-	-	4	-	-	-	-	-	-	-	-	-
162	Nantucket	3,236	-	-	1	-	-	-	-	-	-	-	-	-
163	Medway	3,188	-	-	-	-	3	-	-	-	-	-	-	-
164	West Bridgewater	3,171	-	-	-	-	-	-	-	-	-	-	1	-
165	North Brookfield	3,150	-	-	-	-	-	-	-	-	-	-	-	-
166	Bourne	3,129	-	-	2	-	-	-	-	-	-	-	-	-
167	Belchertown	3,106	-	-	2	-	1	-	-	-	-	-	-	-
168	Bellingham	3,062	-	-	-	-	2	-	-	-	-	-	-	-
169	Weston	3,055	-	-	4	-	-	-	-	-	11	-	-	-
170	Hardwick	3,037	-	-	9	-	-	-	-	-	-	-	-	-
171	Ayer	3,027	-	-	23	-	-	-	-	-	-	-	4	-
172	Deerfield	3,007	-	-	4	-	-	-	-	-	45	-	-	-
173	Cohasset	2,978	-	-	2	-	-	-	-	-	-	-	1	-
174	Lenox	2,943	-	-	-	-	-	-	-	-	1	-	-	-
175	Hadley	2,912	-	-	-	-	-	-	-	-	-	-	-	-
176	Norton	2,862	-	-	3	-	-	-	-	-	-	-	-	-
177	Hull	2,861	-	-	-	-	-	-	-	-	-	-	-	-
178	Pepperell	2,853	-	-	4	-	2	-	-	-	-	-	-	-
179	Wilbraham	2,845	-	1	-	-	-	-	-	-	-	-	-	-
180	Holliston	2,836	-	-	-	-	8	-	-	-	4	-	-	-
181	Hanover	2,797	-	-	-	-	-	-	-	-	1	-	-	-
182	Scituate	2,755	-	-	-	-	2	-	-	-	-	-	-	-
183	Lancaster	2,729	1	-	5	-	1	1	1	1	26	-	31	-
184	Hatfield	2,714	-	-	3	-	1	-	-	-	2	-	-	-
185	Hopkinton	2,649	-	-	1	-	1	-	-	-	2	-	-	-
186	Ashland	2,576	-	-	10	-	1	-	-	-	-	-	-	-
187	Kingston	2,529	-	-	-	-	-	-	-	-	-	-	-	-
188	Manchester	2,507	-	-	23	-	1	-	-	-	-	-	-	-
189	TOWNS UNDER 2,500.	198,172	11	-	329	-	42	-	1	1	349	-	6	-
190	Groton	2,485	-	-	1	-	-	-	-	-	-	-	-	-
191	Groveland	2,446	1	-	4	-	-	-	-	-	1	-	-	-
192	Acton	2,440	-	-	-	-	-	-	-	-	-	-	-	-
193	Shirley	2,425	-	-	-	-	1	-	-	-	-	-	-	-
194	Douglas	2,405	-	-	-	-	-	-	-	-	-	-	-	-
195	Avon	2,404	-	-	15	-	-	-	-	-	116	-	-	-
196	Millville	2,399	-	-	-	-	-	-	-	-	-	-	-	-
197	Rehoboth	2,395	-	-	-	-	1	-	-	-	-	-	-	-
198	Merrimac	2,389	-	-	14	-	-	-	-	-	-	-	-	-
199	Charlton	2,365	-	-	-	-	-	-	-	-	-	-	-	-
200	Rutland	2,353	-	-	-	-	-	-	-	-	-	-	-	-
201	Wayland	2,330	-	-	5	-	1	-	-	-	1	-	-	-
202	Raynham	2,230	-	-	-	-	-	-	-	-	-	-	-	-
203	Hanson	2,226	-	-	-	-	-	-	-	-	-	-	-	-
204	Ashburnham	2,194	-	-	-	-	-	-	-	-	2	-	-	-
205	Harwich	2,131	-	-	-	-	-	-	-	-	-	-	-	-
206	Hamilton	2,109	-	-	6	-	2	-	-	-	12	-	-	-
207	Southborough	2,104	-	-	-	-	-	-	-	-	-	-	-	-
208	Sutton	2,078	-	-	-	-	-	-	-	-	-	-	-	-
209	Upton	2,057	1	-	3	-	1	-	-	-	4	-	6	-
210	Williamsburg	2,023	-	-	17	-	-	-	-	-	-	-	-	-
211	Northborough	2,019	1	-	-	-	-	-	-	-	5	-	-	-
212	Westminster	2,012	-	-	-	-	-	-	-	-	-	-	-	-
213	West Boylston	1,985	-	-	68	-	-	-	-	-	28	-	-	-
214	Townsend	1,970	-	-	8	-	-	-	1	-	111	-	-	-
215	Lunenburg	1,932	-	-	26	-	-	-	-	-	5	-	-	-
216	Cheshire	1,929	-	-	-	-	1	-	-	-	-	-	-	-
217	Sturbridge	1,910	-	-	-	-	-	-	-	-	-	-	-	-
218	Marshfield	1,872	-	-	14	-	-	-	-	-	2	-	-	-
219	Millis	1,863	-	-	-	-	1	-	-	-	-	-	-	-
220	Georgetown	1,861	-	-	-	-	-	-	-	-	-	-	-	-
221	Salisbury	1,847	-	-	-	-	-	-	-	-	1	-	-	-
222	Stockbridge	1,845	-	-	-	-	-	-	-	-	-	-	-	-
223	Northfield	1,831	1	-	9	-	-	-	-	-	2	-	-	-

to the Public Health, 1926 — Continued.

11		101		7		13		40A		8		38		31		32-37		1		9		Line No.
Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
-	-	-	3	64	1	2	-	-	-	12	-	-	-	1	-	-	-	-	-	2	-	150
-	2	-	4	3	-	-	-	1	-	6	-	-	-	1	-	-	-	-	-	-	-	151
-	-	4	1	71	-	3	-	1	-	5	-	12	-	1	3	1	-	-	-	14	-	152
-	-	-	-	-	-	-	-	-	-	5	-	-	-	1	-	-	-	-	-	-	-	153
-	-	1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	1	154
-	2	5	3	-	-	-	-	8	-	4	-	-	-	3	1	-	-	-	-	-	-	155
-	3	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	156
346	4	18	7	11	1	3	-	-	-	2	-	-	-	-	-	-	1	1	2	2	1	157
-	-	-	2	6	-	-	-	-	-	1	-	-	-	8	4	1	1	-	-	47	-	158
-	-	-	1	21	1	-	-	-	-	8	-	-	-	2	-	-	-	-	-	-	-	159
-	1	2	1	66	1	10	-	-	-	14	-	1	-	8	17	1	1	-	-	6	1	160
-	-	-	-	2	-	-	-	-	-	6	-	-	-	2	-	-	-	-	-	-	-	161
-	-	-	1	3	-	-	-	-	-	3	-	-	-	2	-	-	-	-	-	-	-	162
-	-	1	1	46	-	4	-	-	-	7	-	-	-	1	1	1	-	-	-	-	-	163
-	-	-	3	15	-	-	-	-	-	1	-	-	-	1	-	-	1	-	-	9	-	164
-	-	2	8	15	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	165
-	-	-	3	4	-	6	-	-	-	2	-	-	-	4	8	-	-	-	-	-	-	166
-	-	-	3	-	1	-	-	-	-	-	-	1	-	2	2	2	-	-	-	-	-	167
-	-	1	1	31	1	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	168
3	2	2	1	27	1	12	-	-	-	12	-	-	-	-	1	-	-	3	-	23	-	169
-	-	-	2	5	-	-	-	-	-	-	-	-	-	4	1	-	-	1	-	-	-	170
-	-	1	2	4	-	-	-	-	-	3	-	3	-	1	1	-	-	-	-	13	-	171
8	1	4	2	4	-	2	-	-	-	-	-	-	-	3	-	-	-	-	-	7	-	172
1	1	-	1	33	-	-	-	-	-	3	-	-	-	1	2	-	2	2	1	14	-	173
6	2	-	2	1	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	9	-	174
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175
-	-	-	1	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	176
-	-	-	2	4	-	-	-	-	-	-	-	-	-	4	1	-	-	-	-	7	-	177
-	2	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	178
-	2	2	-	-	1	-	-	-	-	5	-	-	-	5	2	-	-	-	-	-	-	179
-	1	-	1	-	-	39	-	-	-	15	-	-	-	2	-	-	-	-	-	36	-	180
-	-	-	2	-	-	-	-	-	-	5	-	-	-	-	1	-	-	-	-	-	-	181
-	-	-	1	-	-	-	-	-	-	3	1	-	-	-	2	-	-	-	-	-	1	182
1	-	6	3	124	1	-	-	-	-	3	-	23	1	2	-	-	-	-	-	8	-	183
-	1	1	3	-	-	-	-	-	-	4	-	-	-	2	2	-	-	-	-	3	-	184
-	-	-	3	126	-	-	-	-	-	10	-	-	-	-	3	1	-	-	-	10	-	185
-	-	1	1	3	-	-	-	-	-	15	-	-	-	1	1	-	-	-	-	19	-	186
-	-	-	1	-	-	-	-	-	-	1	-	-	-	1	1	1	1	-	-	4	-	187
96	53	79	97	1734	15	93	-	10	-	1	-	4	4	117	409	4	29	53	3	481	20	188
6	-	7	1	15	-	-	-	-	-	282	4	-	-	1	3	-	-	-	-	-	-	189
-	1	7	1	1	-	11	-	-	-	6	-	-	-	1	2	-	-	1	-	2	-	190
1	1	-	3	51	1	1	-	-	-	4	-	-	-	-	2	-	-	-	-	-	-	191
43	1	3	-	7	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	192
-	1	-	1	6	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	1	-	193
-	-	-	1	122	-	2	-	-	-	9	-	-	-	-	1	-	-	-	-	-	-	194
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	42	-	-	195
-	-	-	1	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	2	1	196
-	-	1	2	5	1	1	-	-	-	4	-	-	-	1	-	-	-	-	-	-	-	197
-	-	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	198
-	-	-	3	-	-	-	-	-	-	-	-	-	3	-	199	-	-	-	-	-	-	199
3	2	4	-	11	-	7	-	-	-	-	-	-	-	1	2	-	1	-	-	-	-	200
5	-	-	-	13	1	-	-	-	-	4	-	-	-	1	1	-	-	1	-	33	2	201
-	-	-	-	9	-	-	-	-	-	4	-	-	-	1	-	-	-	-	-	-	-	202
-	-	4	1	59	1	-	-	-	-	1	-	-	-	12	27	-	1	-	-	-	-	203
-	-	-	-	1	-	-	-	-	-	2	-	-	-	2	1	-	-	10	-	-	-	204
-	1	-	1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	205
-	1	-	-	34	1	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	206
-	-	-	1	4	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	7	-	207
-	-	-	1	-	-	-	-	-	-	1	-	-	-	2	1	-	-	-	-	-	1	208
-	-	-	-	34	-	-	-	-	-	2	-	-	-	2	-	-	-	-	-	-	-	209
-	-	-	-	34	-	1	-	-	-	1	-	-	-	2	1	-	-	2	-	24	-	210
5	-	3	1	7	-	-	-	-	-	20	-	-	-	2	-	-	1	-	-	-	-	211
-	1	-	-	11	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	212
-	1	-	-	90	1	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	213
-	-	3	3	20	-	1	-	-	-	-	-	-	-	1	1	-	-	1	-	11	-	214
-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	3	-	-	-	-	2	-	215
-	-	-	-	-	-	-	-	-	-	17	1	-	-	-	1	-	-	-	-	-	-	216
-	-	-	1	3	-	2	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	217
-	-	-	1	17	-	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	218
1	1	-	1	18	-	-	-	-	-	6	-	-	-	1	-	-	-	-	-	-	-	219
2	-	1	-	14	-	-	-	-	-	2	-	-	-	1	-	-	1	-	-	8	1	220
-	-	-	-	85	-	8	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	221
-	-	-	1	18	-	-	-	-	-	3	-	1	-	-	-	-	-	1	1	19	-	222
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	223

to the Public Health, 1926 — Concluded.

11		101		7		13		40A		8		38		31		32-37		1		9		Line No.
Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1	-	-	-	3	-	-	-	-	-	2	-	-	-	-	1	-	1	-	-	-	-	298
-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	299
-	-	1	-	5	-	1	-	-	-	1	-	-	-	1	2	-	-	-	-	9	-	300
-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	301
-	-	1	1	7	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	302
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	303
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	1	-	1	304
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	1	305
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	306
-	-	-	-	85	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	307
-	-	-	-	26	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	6	-	308
-	1	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	309
-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	310
-	-	1	-	5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3	-	311
-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	312
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	313
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	315
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	316
-	3	-	2	5	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	317
-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	12	1	318
10	-	-	-	4	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	5	1	319
-	-	-	1	-	-	-	-	-	-	9	-	-	-	-	-	1	-	-	-	1	1	320
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	8	-	321
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	322
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	323
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	324
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	325
-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	326
-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	327
-	-	-	-	5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	328
-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	329
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	331
-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	332
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	333
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	334
-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	335
-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	336
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	337
-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	338
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	339
-	1	-	-	4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	340
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	341
-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	342
-	-	-	1	13	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	343
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	344
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	345
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	346
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	347
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	348
-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	349
-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	351
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	352
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	3	-	353
-	-	-	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	354
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	355
-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	356
-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	357
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	358
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	359
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	360
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	361
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	362
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	363
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	364
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	365
40	2	39	22	4	-	-	-	-	-	2	-	29	6	48	85	6	3	1	-	-	1	366

In addition to the foregoing there occurred 2 cases of *actinomyces* with 1 death.

	Cases.	Deaths.
Boston	1	1
Greenfield	1	-

13 cases of *anthrax* with 1 death:

Haverhill	5	-
Lynn	4	-
Peabody	1	-
Worcester	3	1

169 cases of *dog bite*:

Amesbury	2	-
Amherst	1	-
Auburn	1	-
Belmont	2	-
Beverly	2	-
Billerica	3	-
Boston	32	-
Cambridge	11	-
Chelmsford	3	-
Danvers	2	-
Deerfield	1	-
Everett	5	-
Great Barrington	1	-
Holyoke	3	-
Lowell	27	-
Malden	5	-
Mansfield	1	-
Marblehead	2	-
Medford	7	-
Melrose	1	-
Newton	2	-
North Attleborough	1	-
Peabody	21	-
Quincy	2	-
Revere	12	-
Salem	1	-
Somerville	1	-
Springfield	5	-
Swampscott	3	-
Waltham	1	-
Wayland	2	-
Winchester	1	-
Winthrop	5	-

8 cases of *dysentery* with 8 deaths:

Boston	2	6
Fall River	1	-
Grafton	-	1
Ipswich	2	1
Lawrence	1	-
Malden	2	-

105 cases of *encephalitis lethargica* with 78 deaths:

Adams	2	-
Attleborough	-	5
Barnstable	1	1
Belmont	2	-
Beverly	2	-
Billerica	-	1
Boston	29	18
Brockton	1	-
Brookline	1	1
Cambridge	7	3
Charlton	1	1
Cohasset	-	1
Danvers	1	-
Dartmouth	-	1
Dunstable	-	2
Everett	2	1
Fairhaven	1	-
Fall River	2	3
Framingham	1	-
Gardner	-	1
Haverhill	2	2
Hingham	1	-
Hull	1	-
Lawrence	1	1
Leominster	1	1
Lowell	1	1
Lynn	2	1
Malden	1	-
Mansfield	1	1
Marblehead	1	-
Melrose	1	1

	Cases.	Deaths.
Merrimac	-	1
Methuen	-	1
New Bedford	2	2
Newburyport	1	2
Newton	-	3
Northampton	5	3
Palmer	-	1
Peabody	1	-
Pittsfield	3	2
Plainville	1	-
Princeton	-	1
Salem	5	3
Somerville	3	-
Southbridge	1	-
Springfield	7	4
Waltham	2	2
Watertown	1	-
Wellesley	-	1
Westfield	-	1
Worcester	6	3
Wrentham	1	1

665 cases of *hilum tuberculosis*:

Andover	2	-
Avon	1	-
Belmont	1	-
Beverly	1	-
Boston	289	-
Brockton	1	-
Cambridge	1	-
Canton	2	-
Chicopee	6	-
Clinton	1	-
Colrain	1	-
Dalton	6	-
Dedham	2	-
Deerfield	1	-
Everett	15	-
Fall River	26	-
Fitchburg	27	-
Framingham	11	-
Gardner	19	-
Gloucester	1	-
Greenfield	6	-
Harvard	1	-
Haverhill	1	-
Hinsdale	4	-
Holden	1	-
Holyoke	6	-
Lenox	2	-
Leominster	8	-
Lexington	3	-
Lowell	62	-
Ludlow	1	-
Lynn	25	-
Malden	4	-
Maynard	1	-
Medford	1	-
Newburyport	4	-
Newton	2	-
North Andover	2	-
Northampton	3	-
Northbridge	12	-
Norwood	3	-
Peabody	5	-
Pittsfield	24	-
Revere	1	-
Salem	4	-
Sherborn	2	-
Somerville	6	-
Southbridge	8	-
Southwick	2	-
Springfield	21	-
Sterling	1	-
Stoughton	3	-
Templeton	1	-
Wakefield	2	-
Washington	1	-
Wayland	2	-
Webster	8	-
West Newbury	1	-
Weston	1	-
Williamstown	3	-
Winthrop	3	-

8 cases of *hookworm*:

Boston	7	-
Springfield	1	-

	Cases.	Deaths.
1 case of <i>leprosy</i> :		
Ludlow	1	-
22 cases of <i>malaria</i> with 1 death:		
Andover	1	-
Belmont	1	-
Boston	8	-
Brockton	1	-
Cohasset	1	-
Everett	1	-
Malden	2	-
Newton	3	1
Peabody	1	-
Winchester	1	-
Worcester	2	-

16 cases of <i>pellagra</i> with 10 deaths:		
Acushnet	1	1
Arlington	-	1
Boston	3	2
Cambridge	1	-
Danvers	-	1
Fall River	1	-
Fitchburg	-	1
Leominster	1	-
Medfield	-	1
Northampton	2	2
Pittsfield	1	-
Waltham	1	-
Westborough	-	1
Worcester	5	-

129 cases of <i>septic sore throat</i> with 35 deaths:		
Amherst	1	-
Andover	1	-
Beverly	2	-
Boston	67	12
Cambridge	3	2
Chelsea	1	-
Danvers	-	1
Fall River	8	-
Franklin	1	-
Georgetown	-	1
Greenfield	1	-
Haverhill	3	1
Holliston	1	-
Holyoke	1	1
Lanesborough	-	1
Lawrence	-	2
Littleton	1	-
Lowell	4	3
Lynn	3	3
Mansfield	1	-
Marlborough	1	-
Melrose	2	-
New Bedford	3	-
Newburyport	1	1
Newton	1	-
North Attleborough	-	1
Peabody	1	-
Rehoboth	2	-
Somerville	2	-

	Cases.	Deaths.
Springfield	3	1
Wakefield	1	2
Walpole	2	1
Watertown	2	1
Wellesley	1	-
Westfield	1	-
Weymouth	2	-
Worcester	5	1

4 cases of <i>smallpox</i> :		
Upton	4	-

30 cases of <i>tetanus</i> with 22 deaths:		
Auburn	1	-
Boston	10	7
Chicopee	1	1
Easthampton	-	1
Great Barrington	-	1
Lowell	1	1
Lynn	1	2
Marlborough	-	1
Methuen	1	1
Middleborough	1	-
Natick	1	-
New Bedford	3	2
Northampton	1	-
Peabody	1	-
Pepperell	-	1
Salem	1	-
Springfield	5	3
Somerville	1	1
Worcester	1	-

53 cases of <i>trachoma</i> :		
Attleboro	1	-
Barnstable	1	-
Beverly	1	-
Boston	29	-
Cambridge	4	-
Chelsea	2	-
Dedham	1	-
Everett	1	-
Fall River	1	-
Haverhill	2	-
Lawrence	3	-
Lynn	1	-
Lowell	1	-
Malden	1	-
Newburyport	1	-
Oxford	1	-
Plymouth	1	-
Springfield	1	-

13 cases of <i>trichinosis</i> :		
Boston	5	-
Cambridge	2	-
Cohasset	1	-
Gardner	1	-
Lynn	1	-
Newton	1	-
Westborough	1	-
Worcester	1	-

REPORT OF DIVISION OF BIOLOGIC LABORATORIES.

BENJAMIN WHITE, Ph.D., *Director.*
 ELLIOTT S. ROBINSON, M.D., *Assistant Director.*
 WILLIAM A. HINTON, M.D., *Assistant Director.*

I. ANTITOXIN AND VACCINE LABORATORY.

1. *Distribution of Products.*

The following table shows the amounts of the various products distributed each year for the past five years.

PRODUCT.	1922.	1923.	1924.	1925.	1926.
Diphtheria Antitoxin, 1,000 unit doses . . .	336,730	411,507	442,905	370,412	296,591
Antimeningococcic Serum, 15 cc. doses . . .	4,296	4,609	3,949	3,262	2,451
Antipneumococcic Serum, 100 cc. doses . . .	721	336	335	256	247
Antipneumococcic Serum, bulk cc.	—	—	—	278,600	215,750
Smallpox Vaccine Virus, capillary tubes . . .	189,215	197,767	249,090	273,153	298,834
Typhoid-Paratyphoid Vaccine, 1 cc. doses . . .	66,959	60,976	65,512	90,776	88,842
Schick Outfits, 50 doses each	3,235	5,875	6,427	5,403	5,031
Diphtheria toxin (bulk) cc.	155½	170	140	515	350
Diphtheria Toxin-Antitoxin Mixture, 1 cc. doses . . .	96,407	174,589	309,294	171,405	205,589
Scarlet Fever Streptococcus Antitoxin, doses . . .	—	—	—	319	3,712
Normal Serum, cc.	4,665	7,670	39,415	20,290	9,865

(1) The falling off in the amount of diphtheria antitoxin distributed is due to the unusual decrease in the number of diphtheria cases. During the last month of the year, however, a rise in distribution took place owing to an increase in the reported cases.

(2) The decrease in the amount of antimeningococcic serum given out is due to two factors: (a) the continued low incidence of the disease and (b) the policy of the laboratory in cutting orders to amounts required for immediate needs.

(3) The decreased output of antipneumococcic serum is due to the relative infrequency of cases of Type I lobar pneumonia and the increased use of the concentrated product of Dr. Felton. The production of this serum has continued high, the bulk of the material being sent to Dr. Felton for concentration and experimental purposes.

(4) There has been a continued increase in the amount of smallpox vaccine virus distributed from this laboratory. The greater demand is undoubtedly due to the more thorough way in which the compulsory vaccination law is being administered.

(5) The amount of typhoid-paratyphoid vaccine distributed is practically the same as that distributed in 1925 and remains at a level higher than that of previous years.

(6) Fewer Schick outfits are being sent out because it is becoming more and more the practice to give toxin-antitoxin immunizations to pre-school and school children without performing previous Schick tests.

(7) After a falling off in the demand for diphtheria toxin-antitoxin mixture in 1925, increased amounts were sent out in 1926. Considerable quantities were supplied to the Boston School Department where systematic active immunization is being carried on, and other large amounts have been sent to various cities and towns where anti-diphtheria campaigns have been begun.

(8) In 1926 approximately ten times the amount of scarlet fever streptococcus antitoxin was sent out than in 1925 when it first came to production. The demand for this product far exceeds the supply and not yet is it possible to send regular supplies to all distributing stations. It might be mentioned here that improvements have been made in the production of this antitoxin and that its use has led to gratifying results in the treatment of scarlet fever.

(9) In addition to the various amounts of various products distributed, stocks of all products except scarlet fever streptococcus antitoxin are sufficient to meet anything but a most unusual emergency.

2. *Expenses.*

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1922	\$30,700.00	\$30,690.50	\$29,400.00	\$29,360.80	\$60,100.00	\$60,051.30
1923	35,620.00	35,229.51	30,002.56	30,001.73	65,622.56	65,231.24
1924	41,000.00	40,983.18	34,065.81	33,900.28	75,065.81	74,883.46
1925	43,200.00	42,507.56	34,648.52	33,342.18	77,848.52	75,849.74
1926	46,000.00	45,025.29	31,184.94	30,751.08	77,184.94	75,776.37

3. *Discussion.*

It will be noted that along with the increase in salaries there has been a decrease in the amount of money spent for expenses. This showing ought to furnish convincing evidence that a liberal policy in compensation can be made a paying one. It should be pointed out also that in spite of the decrease in expenses, a greater volume of work has been done.

4. *Improvements.*

Various betterments have been made in apparatus, equipment and methods. The old hand-iced freezing tanks for vaccine virus have been replaced with more satisfactory and economical electric refrigerating tanks. An additional electric bake oven for sterilization of glassware has been added, and hot air sterilization by electrical means has been carefully investigated and the methods improved. Many new improvements have been made in the technic of injection and bleeding of horses. Renewed attention has been given to the feeding of horses, and by varying the diets and introducing special rations the horses have been kept in better physical condition than ever before at no additional cost.

5. *Personnel.*

The past year has shown a smaller turnover in labor than ever before. With the more permanent organization made possible by the salary increases granted, it has been possible to carry on the work of the laboratory with no additional helpers and with far greater efficiency. Many members of the staff are still underpaid, but it is hoped that these inadequacies of compensation may soon be corrected.

6. *Educational Activities.*

(a) *Teaching.* — This laboratory has taken a still greater part in the teaching of students in the Harvard School of Public Health. These students first receive instruction in public health bacteriology under Professor Zinsser; then are given a course in applied immunology consisting of the rationale and practice of making antitoxins, serums and vaccines at this laboratory; then are given a course in epidemiology by Professor Rosenau. No other public health school in the country is able to give such comprehensive instruction in communicable diseases. The course intended for the training of skilled workers for public health laboratories, conducted jointly with the Department of Biology of Simmons College and with other departmental laboratories, has been continued and three trained assistants were graduated and immediately placed in desirable positions. Both the Director and the Assistant Director have given lectures on immunologic topics in the courses in bacteriology and immunity in the Harvard Medical School. In addition to the students taking the stated course, the laboratory has had many student visitors for longer or shorter periods coming from the following countries: Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, England, France, Hungary, Ireland, Japan, Jugoslavia, Mexico, Norway, the Philippines, Roumania and Spain.

(b) *Demonstrations.* — This laboratory has been utilized by the Harvard Medical School, the Medical Schools of Tufts University and Boston University, by classes from Simmons College and classes of nurses from many hospitals. Demonstrations have been given to these students of the methods employed in the production of various biologic products.

(c) *Lectures and Addresses.* — In addition to lectures in the Harvard Medical School and the School of Public Health, the Director and Assistant Director have given talks or addresses before medical societies, science clubs and women's clubs.

(d) *Investigations.* — Along with the routine work, studies have been made of several immunologic problems, such as the flocculation test for determining the potency of diphtheria toxins and antitoxins, the use of toxin-tapioca injections in the active immunization of horses for the production of diphtheria antitoxin. The question of the immunization of horses against pneumococcus for the production of a more potent serum has been carried out in collaboration with Professor Zinsser and Professor Felton of the Harvard Medical School. This work is still continuing. The recent work of Tunncliffe, and Ferry and Fisher on the production of measles antitoxin seemed so promising that one horse has been treated with cultures and toxins of the Tunncliffe organism. This serum has been processed and is now under therapeutic trial. The effect of low temperatures on toxin-antitoxin mixture has been restudied and the result will soon come to publication. In addition, experiments have been carried out to determine the immunizing value of toxin-antitoxin mixtures. This study will be continued.

(e) *Publications.* — The one paper published was published by Dr. Benjamin White under the title "Diphtheria Prevention" in the Boston Medical and Surgical Journal, Vol. 195, No. 13, pp. 625-631, Sept. 23, 1926.

7. Inspection.

During the autumn the Director of the United States Hygienic Laboratory made an annual inspection of the laboratory and there is every reason to expect that the Federal license covering all products manufactured at this laboratory will be continued.

8. New Buildings.

The progress made during the year makes it seem likely that at last the greatly needed additions to the laboratory building and the stables will be erected in the very near future. The necessary funds have been obtained, detailed plans have been drawn and it is expected that before the end of the calendar year construction will be begun, adding nearly 100 per cent more space to the laboratory building and about 60 per cent more space to the stable building. With the completion of these buildings, the present overcrowding will be done away with and it should be possible to meet all demands made on this laboratory for biologic products.

II. WASSERMANN LABORATORY.

In the Wassermann Laboratory the number of tests has shown the expected increase. The Wassermann tests showed an increase of about 4 per cent over the previous twelve months and in addition the Kahn precipitation test for the diagnosis of syphilitic infections is being carried out and is of particular value in the case of hemolyzed blood specimens.

The routine activities of the Wassermann Laboratory continued to increase as is shown in the accompanying table.

1. Tests and Examinations.

	1922.	1923.	1924.	1925.	1926.
Wassermann Tests	47,488	56,214	60,534	62,695	64,665
Kahn tests	—	—	2,554	2,729	1,302
Gonococcus Fixation Tests	1,476	1,542	1,661	1,903	1,776
Lange's Colloidal Gold Tests	157	105	88	33	25
Complement Fixation Tests for Glanders	—	—	—	50	27
Complement Fixation Tests for Antimeningococcic Serum	—	—	—	—	79
Diagnostic Examinations for the Division of Animal Industry:					
(a) Complement Fixation Tests for Glanders	279	145	110	42	43
(b) Examinations for Rabies	482	413	283	282	312
(c) Pathologic and Bacteriologic Examinations	55	34	34	37	39
(d) Agglutination Tests for Bacillus Abortus	—	—	148	89	101
	49,937	58,453	65,412	67,860	68,369

2. Expenses.

The expenses for the past five years are shown in the following table:

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1922 . . .	\$9,477.00	\$9,170.26	\$5,731.58	\$5,726.63	\$15,208.58	\$14,896.89
1923 . . .	11,600.00	10,663.15	5,600.00	5,631.33	17,200.00	16,294.48
1924 . . .	11,800.00	11,689.70	6,000.00	5,827.65	17,800.00	17,517.35
1925 . . .	12,500.00	11,984.70	6,000.00	5,971.18	18,500.00	17,955.88
1926 . . .	12,600.00	12,186.98	5,500.00	5,386.40	18,100.00	17,573.38

It will be seen from the above table that an increased amount of work and, therefore, of service has been performed at a decreased cost. It will be further noticed that while an increased amount has been expended for personal services, a decreased amount has been spent for expenses. This accomplishment bears out one of the fundamental principles mentioned in the report of the Griffenhagen Associates, which is, "Higher individual rates, securing more capable employees, and greater attention to effectiveness of organization and procedure so that more work may be done better with fewer employees at higher pay, is the way to true economy and better service in the long run."

3. Investigation.

A statistical study was made of the comparative results obtained by the Wassermann and Kahn reactions. The results of this work were published by Dr. W. A. Hinton under the title "The Kahn and Wassermann Reactions. A Comparative Study," in the Boston Medical and Surgical Journal, June, 1926. Another comparative study has been made of the Wassermann test and the slide test as described by Kline and Young. The results thus far have been most gratifying and they appear to be more reliable even than those obtained from the Wassermann test itself. This study is being continued.

4. Teaching.

The laboratory has been utilized for teaching purposes both in the Harvard Medical School and School of Public Health and in the training of laboratory workers carried on in conjunction with Simmons College. Instruction is given not only in the technic of the various serologic tests, and bacteriologic and pathologic examinations, but also in public health laboratory administration.

REPORT OF DIVISION OF HYGIENE.

MERRILL E. CHAMPION, M.D., *Director.*

The Division of Hygiene, now in its twelfth year, has the following staff: a director, two pediatricians, one school nursing consultant and four general public health nursing consultants, one consultant in nutrition and three assistant nutritionists, one consultant in dental hygiene and health education, two assistants in health education, and a stenographic and clerical staff of twelve. The appropriation for the division's activities for 1926 was \$83,150.

For the sake of convenience and clearness, the work of the division will be discussed under certain headings which in a general way suggest the scope of the activity carried on, namely, maternal, infant and preschool child hygiene; school hygiene; nutrition; dental hygiene; and informational.

Before going into details, it may not be out of place to emphasize the fact that the work of the division of hygiene has to do largely with child hygiene and is entirely advisory in nature. In other words, the division depends for results entirely upon persuasion based on convincing facts rather than upon coercion based on statutory authority.

MATERNAL, INFANT AND PRE-SCHOOL HYGIENE.

Always a part of the division's interests, activities directed toward the promotion of maternal and infant hygiene have been redoubled since 1922 when a special addition was made to the annual appropriations for child hygiene. This phase of the work is the primary interest of one of our pediatricians and the four district nursing consultants. A health education worker, trained in nutrition, also takes part in our Well Child Conferences. These may well be explained before proceeding further.

Well Child Conferences. — The State well child conferences are in the nature of demonstrations, intended primarily to show local communities the need of attention to the apparently well child and the best methods of conducting community efforts in this direction. The children receive a careful physical examination and advice as to hygiene. No treatment whatever is given. Parents are expected to take the children to the family physician for the correction of defects found or other treatment. The family physician receives a copy of the findings of the conference physician. By this means it is hoped to develop a sturdy sense of independence and responsibility on the part of the parent for the health of the child.

During 1926, there were held 62 conferences reaching 1,187 families with 1,907 children including both infants and children of preschool age. Five communities, large or small, subsequently established conferences of their own.

An essential part of the well child conference is the "follow up" afterwards. This is usually done by the local public health nurse. In some small communities without public health nursing service, the duty occasionally devolves upon an interested lay committee and if tactfully carried out is successfully performed. Our state nurses keep in touch with the progress of this follow up. The pediatrician in charge of the state demonstration conferences, wherever possible, visits individually the physicians in the town — either before or after the holding of the conference — and thus helps to make ultimate results more sure.

As has already been indicated, the purpose of the state conference is to point the way for subsequent community action in the shape of a permanent local conference. Such a local conference is not, however, desirable in many of the smaller communities because of the cost. Thus far no better plan has been devised to meet the needs of such small towns than for the state conference to be repeated — a procedure which is contrary to our rule in the case of the larger communities.

It is the hope of the division of hygiene ultimately to extend this demonstration service to prenatal cases, but at present for various reasons this does not seem to be feasible.

Studies in Maternal and Infant Mortality. — Continuing study has been given to statistics dealing with maternal and infant mortality. The publication of a paper

on the results of two years study of maternal deaths was the starting point for further analysis of this mass of figures. Papers will soon be ready on deaths from toxemia and from sepsis. Another paper dealt with a study of 79 cardiac deaths among infants.

Cooperation with Other Departments.—By statute, the licensing of lying-in hospitals is in the hands of the state department of public welfare. The division of hygiene is in constant touch with the supervisor of this lying-in hospital service and many opportunities are found for mutual assistance in raising standards.

Public Health Nursing Consultant Service.—For the purposes of this type of service on the part of the division of hygiene, the state is divided into four districts, each in charge of a public health nurse. Her first and most important duty is to keep in constant touch with the various local nurses in her territory, advising with them and rendering every possible service consistent with state policy. Contact is obtained with the local nurses by means of personal visits, group meetings and, occasionally, through definite assistance with some special project such as a Schick or immunization clinic. The various child hygiene stations are visited as often as possible for the purpose of offering suggestions as to their improvement. A series of conferences was executed last year for local nurses and directors of nursing organizations, in cooperation with the county branches of the Massachusetts Association of Directors of Public Health Nursing Organizations.

Breastfeeding Campaigns.—Demonstrations as to the value of breastfeeding were carried on by the visiting nursing staff of four cities and towns at the instigation of our nursing consultants. With the assistance of the state district health officers the practicing physicians of these communities were reached and their cooperation solicited, in the effort to have as many babies as possible breastfed for six months or more. The results of these demonstrations are not yet available.

SCHOOL HYGIENE.

Our school hygiene activities are carried on by a staff of one pediatrician and one school nursing consultant, assisted by the four district nursing representatives referred to under the discussion of maternal and preschool hygiene. As in past years an effort has been made to keep in touch with the school physicians and school nurses of the state for the purpose of aiding them gradually to raise the standard of this work throughout the commonwealth. Until September, the division of hygiene had the services of two school nursing consultants: since then the general nurses have handled the everyday contacts with the school nurses of the state. It should be remembered that, in Massachusetts, every city and town is obliged to have school medical and nursing service.

As in the case of maternal and preschool work, contacts have been maintained by personal and group conferences. Furthermore, during this year a new service was made available to the local communities in the shape of a complete medical and nursing survey of those school systems desiring it. Eight communities were thus surveyed and recommendations offered. This bids fair to be of permanent value and will be continued.

A goitre survey of fifteen communities was carried on in cooperation with representatives of the United States Public Health Service.

The usual series of joint conferences on the part of the state department of education and the state department of public health for the benefit of school physicians, nurses, superintendents and others was given. These conferences have always proved to be of the greatest value.

The summer school for school nurses, held in connection with the summer school at the state normal school at Hyannis was conducted along similar lines to those of other years. Five nurses received the certificate offered in return for three summers' work. There were 23 nurses in the first year class, and three in the second. A course in school hygiene was also offered teachers at the same school.

NUTRITION.

One consultant in nutrition and three assistant nutritionists carry on this branch of the work of the division of hygiene. The three assistant nutritionists are assigned to the clinics for underweight children carried on by the division of tuber-

culosis. Two of these nutritionists are attached to the main clinic while one handles the follow up work. The duties of those in the main clinic are to discuss with the children and their parents the proper diet and general health habit régime which these below par children should follow. The worker in charge of follow up, on the other hand, checks up later with the school nurse and, on occasion, in the home, to see how the children have reacted to the advice given them in the clinic.

It should be pointed out, however, that the ultimate answer so far as the child of school age is concerned is the establishment of a good system of health habit promotion as an integral part of the school curriculum.

In addition to the clinic work, one of the nutritionists during the summer visited a dozen summer health camps to see what suggestions might be offered along the line of nutrition and health habit promotion.

The nutritionists participated in clinics in 46 places. The nutritionist doing follow up visited 35 towns, interviewed 1,014 children and made 867 home visits.

The senior nutritionist, in charge of the work, concentrated on lectures to groups of key people and on the preparation of educational material and articles dealing with the problems of nutrition. A course of six lessons was given to nurses in five towns. Other lectures were given to dental hygienists, nurses in training schools, teachers and summer school students. The latter included courses at the summer schools at Hyannis and Fitchburg Normal.

DENTAL HYGIENE.

Preparing and explaining a new dental policy for the department has been the major new activity of the division of hygiene this year. It has been a matter of concern for some time that cities and towns were allowing their dental hygiene activities to degenerate into free dental surgery furnished to all at the expense of the taxpayer. Much could be said, did space permit, concerning the wastefulness and inconsistency of such a plan.

Fortunately a demonstration of what can be accomplished by a more intelligent plan is at hand in the work of the Forsyth Dental Infirmary of Boston. With this as a basis and with the advice and assistance of the Massachusetts Dental Hygiene Council, the department through the division of hygiene set forth a policy upon which its advice to local agencies should be based. In briefest outline, its suggestions are:

That municipalities confine their activities so far as possible to educational work, especially with younger children, teaching them the importance of proper diet for the building of good teeth.

That the children in the first grades receive attention first, and that the importance of the sixth year molar be always borne in mind.

That operative work deal with filling pits and fissures and with extracting badly decayed teeth in order to give the child a clean mouth.

That attention be given to the preschool child and to the diet of the prospective mother.

That families be urged to go to their family dentist for treatment. On the other hand, where clinics are desirable, that they be carried on preferably in connection with hospitals and that they be so far as possible on a paying basis.

In view of the fact that we have only one state worker to push this program actively, excellent progress has been made in convincing communities of its essential soundness.

HEALTH EDUCATION AND INFORMATIONAL SERVICE.

This service includes a large number of allied activities which are bound up with the services of the special workers already referred to. Included here are:

The publication of the department's quarterly bulletin *The Commonhealth*.

The distribution of an occasional bulletin for those interested in school hygiene. This goes by the name of *Tidings*.

The division's prenatal and postnatal letter service: These letters go to prospective mothers and are sent monthly until the baby is two years old. In 1926 there were 5,023 new requests for prenatal letters and 4,584 new requests for postnatal letters.

Newspaper service: Brief articles are sent weekly to the newspapers of the state and special news items as occasion offers.

Pamphlets on health subjects: These cover a wide variety including fliers on dental hygiene and nutrition. We distribute on an average about 100,000 of each of these pamphlets a year. An interesting project of last year was one in cooperation with the department of education, division of immigrant education. A pamphlet of twenty health lessons for adult immigrants was prepared, including writing the lessons and making sixty original drawings.

Health Exhibits; Posters: Most of the material employed by the division of hygiene is original and prepared by our own staff. They consist of box exhibits, sets of posters illustrating prenatal, preschool and school hygiene, and many special exhibits for special occasions such as conventions.

One of the earliest activities of the division of hygiene was the health show. These originate in the communities themselves and at their best, represent a demonstration to the people of the town of the possibilities of some health service — public health nursing, for example. In many instances such health shows have as their result the establishment on a permanent basis of some essential service. Sixteen such health shows were held last year. Fifty-two towns were reached by illustrated talks to school children, dealing with the simpler aspects of health.

The project involving reaching the teachers of drawing in the schools of the state was carried almost to completion. The correlation of the teaching of health with the teaching of drawing through the medium of original poster making has been shown to be both possible and attractive. The contacts thus made by the department of public health will prove permanently valuable.

The lecture service of the Department, in general charge of the division of hygiene, has continued to be popular. During the year, 434 lectures and 3 radio talks were given by 31 department speakers in 101 communities of the state to an audience of approximately 33,165 people.

REPORT OF DIVISION OF TUBERCULOSIS.

DR. HENRY D. CHADWICK, *Acting Director.*

On April 1, 1926 Dr. Sumner H. Remick resigned as Director. Dr. Henry D. Chadwick then took up the duties as Acting Director of the Division. The recommendation made by Dr. Remick in his last report of having a physician as assistant director was put into effect in May, 1926, by the appointment of Dr. David Zacks to that position. Dr. Zacks was assigned the supervision of the field nurses who investigate the reported cases of tuberculosis and the recording of these reports. He also was given charge of supervising the tuberculosis dispensaries.

REPORTING OF TUBERCULOSIS CASES.

A recent study shows that the physicians of the State have been very remiss in the duty of reporting cases of tuberculosis. For the State as a whole in 1925 there were 2,883 deaths and 5,385 reported cases, or a ratio of approximately 1.9 to 1. By Counties the ratio of reported cases to deaths was as follows: Barnstable County 1.21 to 1; Berkshire County 1.67 to 1; Bristol County 1.94 to 1; Dukes County 1 to 1; Essex County 1.73 to 1; Franklin County 2.23 to 1; Hampden County 1.66 to 1; Hampshire County 1.32 to 1; Middlesex County 2.11 to 1; Nantucket County 0 to 0; Norfolk County 1.48 to 1; Plymouth County 1.41 to 1; Suffolk County 2.57 to 1; Worcester County 1.35 to 1.

It is a well-known fact that the ratio should be five reported cases to one death each year, if the cases seen by the physicians were reported as soon as diagnosis is made. In Boston recently a survey was made by Dr. Haven Emerson, who found that 19.7% of the cases of tuberculosis were not reported until after death, and 16.7% were not reported until within one month of death. This means that about one-third of all cases are not reported in time to allow the public health authorities to carry out any measures for prevention.

The ratio of reported cases to deaths in the remainder of the State is a little lower than in Boston. Therefore the children and adolescents in about 1,000 homes where there is a case of advanced tuberculosis are being given but little if any protection from massive infection. This indeed is a very serious situation.

RECORDS OF REPORTED CASES.

A new system of recording the reported cases on a punched card has been put into effect and the data on the old cards has been transferred to the new ones. These new cards can be run through a tabulating machine and information as to the number of cases in any city or town, and other recorded data, can be quickly obtained. The field nurses will get a report on each known case of tuberculosis once a year. The method of handling these reports has been simplified so that five nurses will be able to do the work which previously required the services of seven.

There were 30,000 cases in the files, but when these records were studied and transferred to the new cards it was found that 27,489 were located cases, and the addresses of 2,511 were unknown. The new records will be more complete and the follow-up work more effectively done. We will be able to get statistics from these cards of the number of cases in a given locality, and other data in regard to them, with very little time and effort.

SANATORIA.

Rutland State Sanatorium.

The beds at Rutland have been fully occupied throughout the year and there has always been a waiting list. Approximately 250 of the 350 beds have been occupied by contract cases. As these County cases are not selected the result has been that about three-fourths of the patients now under treatment are bed cases. To relieve this situation somewhat a few months ago a new plan was put into effect. This requires the examination of all applicants for admission to Rutland

which come from sections of the State not under contract by some one of the sanatoria staff, except Boston cases, who are examined at the Out-Patient Department of the Boston Sanatorium. In this way at least 100 beds can be kept filled with a more favorable type of patient.

Lakeville State Sanatorium.

The new women's ward for non-pulmonary cases was formally opened in April, 1926. It was soon filled to capacity with women and children. The men's ward was finished in July and was about half filled within a very short time. The capacity of the sanatorium is 200 and indications are that it will not be adequate to care for all the non-pulmonary cases that apply for admission. Provision for sun treatment combined with skilfull orthopedic supervision has already shown excellent results.

A medical building with an operating room is now the greatest need of the institution. Plans for such a building have been submitted and an appropriation of \$48,000 requested for construction and equipment.

North Reading State Sanatorium.

The three wards which were under reconstruction at this institution were completed last spring and made ready for children. Plans to remodel the service building, which will cost about \$14,000, have been submitted. These call for an addition so that the bakery can be moved out of its present location. This will result in giving more space and light in the kitchen. The chimneys will be increased in height to give better draught and the refrigerating rooms rebuilt and enlarged. The seating capacity of one of the dining rooms will be increased by these proposed changes.

Westfield State Sanatorium.

This sanatorium has a capacity of 310 beds for children. Since North Reading was opened for children not enough applications to fill both sanatoria have been received. As a result there have been about 40 vacancies at Westfield. To fill these beds we have admitted about a dozen women and about the same number of men as a temporary measure, to relieve the waiting list for Rutland. Until sufficient applications for children are received to fill both Westfield and North Reading it would be a good policy to admit adults to both of these sanatoria.

The housing situation for employees at Westfield is inadequate and plans have been drawn for a dormitory for nurses and attendants. An appropriation of \$38,500 is needed to construct and furnish this building.

Available Beds for Tuberculous Patients.

There are at the present time 3,638 beds available for tuberculous cases in the State. They are classified as follows: State Sanatoria 1,081; State Infirmary 280; Municipal Hospitals 1,061; County Sanatoria 604; Private Sanatoria and boarding houses 97; Hospitals for Mental Diseases 332; School for Feeble Minded 20; State Farm 4; West Rutland Prison Camp 70. There were 2,883 deaths from tuberculosis in Massachusetts in 1925, so there is a ratio of more than one bed for each death. This is considered adequate in number, but unfortunately the geographical distribution of these beds is not such as to prevent waiting lists in some sections of the State and vacant beds in others. If some working agreement could be made whereby the 70 or more vacant beds in the County sanatoria could be used for patients residing in other counties no waiting list would result and everyone needing sanatorium treatment could be accommodated without delay. On November 30th there were 75 vacancies in the State Sanatoria for children, and for men with non-pulmonary tuberculosis; 79 vacancies in the County sanatoria, and 170 vacancies in the Municipal hospitals. It is evident therefore, that Massachusetts does not need more beds but an effort made to make more attractive the municipal hospitals so that patients will be willing to go to them for treatment and be contented to remain. Also the Counties which have more beds than are needed for their population should be willing to make favorable terms with other sections of the State where the number of patients exceed the number of available beds.

Juvenile Tuberculosis.

The effect of the State clinics carried on under the Ten-Year Program has not materially increased the number of children applying for admission to the State Sanatoria. It has, however, been the means of securing a better selection of patients. By that I mean that the children coming to the sanatoria are more in need of such treatment than was formerly the case. This is brought about by the greater local interest aroused in child welfare work with the result that many more children are being given thorough examinations and good supervision at home. The rapid increase of summer camps which are now very well managed give a large number of children the benefits which formerly could only be obtained in a sanatorium for children. It is probable that the 500 beds now available for children in Westfield and North Reading will not all be required. There are now in these two sanatoria about 400 children and I believe this represents about the peak of the demand for sanatorium care.

The Ten-Year Program.

The personnel of the clinic group now consists of one nurse who acts as an advance field agent, 5 doctors, 2 stenographers, 2 nurses, 2 nutritionists, and one X-ray technician. The follow-up work group consists of one physician, one nurse and one nutritionist. Four stenographers are employed on the records and reports. Three of these are doing this work at Westfield where a clinic office is maintained. I do not anticipate that any additions to this clinic personnel will have to be made in the future. The organization as it now stands seems to be quite complete.

More than three-quarters of the population of the State will have been covered at the end of the third year. I think the balance can easily be completed next year and in addition probably some of the cities which had the clinic the first year can have a second examination. Officials in some of these cities and towns are already asking to have the clinic return for another examination of their children.

During the past year clinics have been held in the following 62 cities and towns: Adams, Amesbury, Andover, Amherst, Athol, Avon, Becket, Belmont, Boston, Byfield, Chelmsford, Chicopee, Cochrane, Colrain, Dalton, Dedham, Dudley, Easthampton, Erving, Fitchburg, Gardner, Greenfield, Holyoke, Hinsdale, Lanesborough, Lee, Leominster, Lexington, Leverett, Lincoln, Littleton, Lowell, Montague, Newbury, Newburyport, New Salem, North Adams, Northampton, Northbridge, Peabody, Pittsfield, Princeton, Randolph, Reading, Salem, Salisbury, Shutesbury, Southbridge, South Deerfield, South Hadley, Sudbury, Sterling, Warwick, Webster, Wendell, Westfield, Westford, West Newbury, Williamstown, Winchendon, Woburn.

Summary of Result of the Second Year's Examination.

	Total.	Per Cent.
No. of children examined	19,073	—
No. of contacts examined	2,956	—
No. given Von Pirquet test	18,601	—
No. of children with positive Von Pirquet (reactors)	5,314	28.5
No. of children X-rayed	5,730	—
No. of cases diagnosed as "Pulmonary" Tuberculosis	19	—
No. of cases diagnosed as Hilum Tuberculosis	621	3.3
No. diagnosed as "Suspects"	1,399	7.0
No. of cases X-rayed and classified as negative	3,691	—
No. of children with enlarged and diseased tonsils and adenoids	3,652	19.0
No. of children with defective teeth	8,575	45.0
No. of children with heart murmurs	398	2.0

The immediate effect of the clinics has been to stimulate local interest in the care of cases of juvenile tuberculosis which have been found, and also of the chil-

dren showing malnutrition. Many local organizations have undertaken the maintenance of summer camps, and a large proportion of the children picked out by the clinic have been given the opportunity to live for a few weeks in the fresh air and sunshine. They have been furnished with suitable diet and given the rest periods that all these children are so much in need of. The results obtained are bound to have a marked influence for good health, and by stimulating resistance to the tuberculous infection which they have, will prevent many from developing a fatal form of tuberculosis in later years.

The Control of Tuberculosis.

This is dependent upon two things. We must lessen the amount of infection from both human and bovine sources, and increase the resistance of children to the infection that cannot as yet be prevented. By hospitalization of open cases of pulmonary tuberculosis we can lessen the foci of infection from human sources. By stopping the sale of unpasteurized milk we can materially reduce the deaths and the crippling of children. At the present time the following cities and towns have ordinances requiring all milk to be pasteurized, except that from tuberculosis-free cows: Arlington, Belmont, Boston, Brookline, Brockton, Cambridge, Framingham, Leominster, Milton, Natick, New Bedford, Needham, Newton, Pittsfield, Malden, Quincy, North Brookfield, Somerville, Springfield, Stockbridge, Walpole. There are 1,709,000 people, or 41% of the population of the State, living in these cities and towns. It is gratifying to report that the children in this large area are now protected from the danger resulting from infection of the bovine type of the tubercle bacillus.

A study of the tuberculin tests made by the State Clinic group indicates a higher percentage of infection among the children in small towns who have not been exposed to human tuberculosis, than is the case in the cities where the use of pasteurized milk is more universal. This can only be accounted for by the more general use of raw milk from tuberculous cows. The children brought up on the farms are in more danger of being crippled or dying in infancy from tuberculosis of bovine origin than are city children. Dr. Charles Mayo states that the majority of cases of tuberculosis of the neck, intestines and abdomen are found in children from the farms and not from the cities. It is noteworthy that 11% of the rural reactors in our childrens' clinics had enlarged glands of the neck, and but 6.3% of the city children. There were 12% more reactors among the non-contact rural children than among the urban non-contact children. These figures would indicate greater prevalence of bovine infection in the small communities of Massachusetts where but little if any of the milk is pasteurized. As pasteurization is impractical for the small farmer it is all the more important that cows should be tuberculin tested and the reactors eliminated from the herd. For the protection of his own children and his customers' children this should be done.

SUMMARY OF THE TASK BEFORE US.

First. — We should strive to get the physicians to report their cases of tuberculosis as soon as diagnosis is made that better supervision may be carried out.

Second. — Children exposed to tuberculosis should be examined, treated, if necessary, and guarded from further infection.

Third. — Hospitalization of all the open cases of tuberculosis, if possible, especially if there are children in the homes.

Fourth. — Pasteurization of the public milk supply.

Fifth. — Elimination of tuberculosis from all the herds in Massachusetts by means of the tuberculin test and the slaughter of all infected animals.

LAKEVILLE STATE SANATORIUM.

RESIDENT OFFICERS.

LEON A. ALLEY, M.D., *Superintendent*.
 HAROLD RAGOLSKY, M.D., *Assistant Superintendent*.
 HAROLD B. BOYD, M.D., *Senior Asst. Physician*.
 MYLES S. RECORD, M.D., *Assistant Physician*.
 CHIN S. CHANG, M.D., *Assistant Bacteriologist*.
 CAROLINE T. WHITE, R.N., *Superintendent of Nurses*.
 KATHERINE NUTE, *Occupational Therapist*.
 SUSAN M. MURPHY, *Head Matron*.
 CHARLES J. ODENWELLER, *Steward*.
 ROBERT A. KENNEDY, *Chief Engineer*.
 THOMAS FRANCIS MAHONY, *Head Farmer*.

NON-RESIDENT OFFICERS.

ZABDIEL B. ADAMS, M.D., *Consulting Orthopedic Surgeon*.
 JOHN B. LOMBARD, D.M.D., *Dentist*.

REPORT OF THE SUPERINTENDENT.

TO GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health*.

I have the honor to submit the seventeenth annual report of the Lakeville State Sanatorium, for the year ending Nov. 30, 1926. During the year there has been expended \$169,595.46 for maintenance, a gross weekly per capita cost of \$25.7507. There has been collected from miscellaneous sources (the total of all collections) \$45,257.02. Deducting this amount from the gross maintenance expense, leaves a net expense of \$124,338.44, and a net weekly per capita cost of \$18.879. There has been collected from private sources \$6,035.00, from Cities and Towns \$33,187.36, from the War Risk Insurance \$567.63, from the State Board of Retirement \$15.09, and from sales \$5,451.94. Thirty-nine patients were supported wholly or in part by private funds, 155 by Cities and Towns, 75 wholly by the State, and there are 32 patients on whom settlement has not been determined.

Your attention is again called to the high per capita cost this year, which was due, as was the case in 1925, to reconstruction work which was responsible for the low house count, the daily average number of patients being 126.6547, while our present capacity, now that the work has been completed is 210.

There has been expended from Special Appropriation, authorized by Chapter 510, acts 1924 (\$20,000 for Employees' Building) expended prior to fiscal year 1926, \$19,613.06, during 1926, \$375.00. Total \$19,988.06. The time limit on the above appropriation has expired, and the balance of \$11.94 is reverting to the State Treasury. Authorized by Chapter 277, acts 1925 and Chapter 398 acts 1926 (\$46,000 for New Water System), expended prior to 1926, \$3,128.11, during 1926, \$27,685.49. Total \$30,813.60. As authorized by Chapter 211, acts of 1925 (\$28,000 for alterations on Children's Building) expended prior to 1926, \$18,616.24. There has been expended to date \$27,154.78. This building has been completed, except for the installation of some automatic sprinklers, for which there is an available balance of \$845.22. As authorized by Chapter 211, acts of 1925, \$33,000 for alteration on Women's Building there has been expended to date \$32,917.23. This building has been completed. As authorized by Chapter 211, acts 1925, \$6,500.00 for alteration on Administration Building there has been expended to date \$6,482.66. This work has been completed. As authorized by Chapter 79, acts of 1926 (Reconditioning Men's Building \$40,000). There has been expended to date \$38,679.83. The work on this building has been practically completed, except for some automatic sprinklers. The details of these disbursements are contained in the report of the Treasurer.

There were 102 patients in the Sanatorium at the beginning of the year, December 1st, 1925, and 171 at the close, November 30, 1926. The largest number present at one time was 172, and the smallest 90. The daily average number of patients was 126.6547, four less than last year. Daily average number of bed patients was

93.2327, children 56.0684, adults 37.1643. There were 200 patients admitted during the year. For the classification of patients admitted, your attention is called to Table No. 7. The average age of patients admitted was $19\frac{1}{2}$ years. Including deaths there were 131 patients discharged, and the average duration of residence was 359 days. Of those discharged 96 gained $1,404\frac{1}{2}$ pounds, an average gain of 14.63 pounds per person. Of those discharged there were 5 arrested, 5 apparently arrested, 30 quiescent, 58 improved, 12 unimproved, 13 deaths, 3 not considered, the duration of treatment being less than one month, 5 non-tuberculous. There were 46,229 hospital days of treatment, 1,417 less than for 1925.

MEDICAL REPORT.

Appointments. — On January 1st, 1926, Dr. Z. B. Adams of Boston was appointed Consulting Orthopedic Surgeon. Dr. Adams makes a weekly visit to the Institution.

On Feb. 1st, 1926, Dr. John B. Lombard was appointed Dentist. He is on duty two days each week.

On May 3rd, 1926, Dr. Chin S. Chang was appointed Assistant Bacteriologist.

On September 1, 1926, Dr. Harold Ragolsky was promoted from Assistant Physician to Assistant Superintendent.

On November 30, 1926, Dr. Myles S. Record, a graduate of Tufts College Medical School and of the Lowell Corporation Hospital was appointed Assistant Physician.

On July 19, 1926, Miss Katherine Nute, a graduate of Sargent School, Boston, and the Boston School of Occupational Therapy was appointed Occupational Therapist.

The standard forms of medical records have been continued during the year, and photographs taken, at the time of the patient's admission and at various times during his residence, have been added.

The very valuable work which Dr. Chang has done in the Laboratory in proving the diagnosis on many of the extra-pulmonary cases has made our records of the utmost value for purposes of study. A summary of the work done in the Laboratory during the last year is incorporated as a part of this report.

LABORATORY AND X-RAY REPORT.

	Number.	Total.
Pathology: Preservation of specimen	—	69
Clinical Microscopy:		
Routine examination of blood	—	150
Sputum:		
Positive T. B.	151	—
Negative T. B.	410	561
Urine	—	459
Feces	—	14
Spinal fluid cell counts	2	—
Smears	4	6
Urethral discharges	—	4
Bacteriology:		
Preparation of media:		
Glycerine Bouillon ¹		
Glycerine Agar ¹		
Blood Agar plates ¹		
Petroff's medium ¹		
Glycerine Egg ¹		
Glycerine Agar and Egg medium ¹		
Smears	—	961
Cultures:		
Throat	—	9
Urine	—	5
Tonsils	—	30
Sputum	—	4
Pus (abscesses, sinuses and broken down glands)	—	152
Abdominal fluid	—	5

¹ Every month.

Serology:		Number.	Total.
Tubercumet Tests		—	150
Tuberculin Tests		—	302
Typhoid Agglutination (Widal Reaction)		—	82
Preparation of blood for Wassermann Test		160	—
Preparation of spinal fluid for Wassermann Test		2	162
Animal Experiment:			
Guinea pig inoculation		—	161
Cut		—	1
Autopsy:			
Positive T. B.		43	—
Negative T. B.		76	—
Proven Tuberculosis:			
Guinea pig, Cultures and Microscopic Diagnosis (from the lesion):			
	Human Type.	Bovine Type.	
Laryngeal Tuberculosis	2	—	
Abdominal Tuberculosis	4	—	
Pulmonary Tuberculosis	181	—	
Tuberculosis of the Arm	1	1	
Tuberculosis of the Neck	3	—	
Tuberculosis of the Kidneys	5	—	
Tuberculosis of the Leg	1	—	
Tuberculosis of the Knee-joint	4	1	
Tuberculosis of the Hip	4	1	
Tuberculosis of the Thigh	1	2	
Tuberculosis of the Inguinal	1	—	
Tuberculosis of the Tonsil	1	—	
Tuberculosis of the Foot	2	—	
Tuberculosis of the Wrist	2	—	
Tuberculosis of the Appendix	1	—	
Tuberculosis of the Buttock lesion	—	1	
Tuberculous Dactylitis	3	—	

X-Rays.

Number of X-rays taken from December 1, 1925 to November 30, 1926	661
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DENTAL REPORT.

Feb. 2nd to Nov. 30, 1926.

Examinations	266
Cement fillings	130
Amalgam	34
Root Canal fillings	4
Temporary fillings	101
Gutta-Percha fillings	32
Treatments	181
Abscesses	7
Abscesses treated	7
Root Canal Dressings	21
Prophylaxis	57
Mouth Washes	36
Gingivitis	11
Extractions	63
Post-Extraction treatments	7
X-rays	14
Bedside treatments	79
Plates	4
Bridges	6
Crowns	7
Plates repaired	7
Bridges repaired	2

The large number of cement fillings over amalgam fillings is explained by the fact, that the greater number of our patients are confined to bed, or in such positions in casts or on frames that proper cavity preparation for a more permanent type of filling is impossible or impractical.

The comment of the oral condition of the patients admitted to this Institution during the past years, by the dentist is as follows: "with the exception of four patients whose oral condition is very poor, the oral condition as an average among the patients at the Institution will compare favorably with an equal number of persons taken from a general private practice of apparently non-tubercular people."

Staff meetings on Monday mornings of each week for the consideration of administrative and medical problems have been continued throughout the year. Clinical conferences have been held on Wednesday mornings for the consideration of new admissions and methods of treatment. Each Friday a visit is made by the entire staff through the Institution, together with the Consulting Orthopedic Surgeon, at which time, every patient is visited and the progress of the case discussed. These various meetings, conferences, and staff visits have been of great value, both to the members of the staff and the patients. It has made possible, satisfactory and uniform methods of procedure in carrying out heliotherapy; and the use of various forms of apparatus with such a large number of patients at one time.

Consultation clinics have been held monthly at Fall River, Taunton, Brockton and Plymouth. A total of 40 patients were examined at these clinics, and 59 cases were examined at the Sanatorium, making a total of 99 patients.

Consultation Clinic Report.

PLACE.	New Patients examined.	Re-Exami- nations.	Total Number examined.
Fall River	11	4	15
Taunton	5	5	10
Brockton	2	2	4
Plymouth	6	5	11
	<hr/> 24	<hr/> 16	<hr/> 40

Because of the small attendance at the Clinics and the fact that Out Patients may be examined at the Sanatorium on any week day, they were discontinued at the close of the year.

The Immunization policy has been carried out with both patients and employees. This includes vaccination, Schick testing, and the giving of toxin and antitoxin where it is indicated, typhoid and paratyphoid antitoxin. A Widal test is done on all food handlers on their arrival at the Institution, and specimens of feces and urine are sent to the Department Laboratory for examination.

Patients have been treated by Heliotherapy throughout the year, and the results in both children and adults have been most encouraging. At the present time, certain types of patients suffering from extra-pulmonary tuberculosis are being grouped and careful records kept, in order that during the coming year, many of these cases may be reported in the various Medical Journals, as the diagnosis of tuberculosis has been proven by the demonstration of tubercle bacilli in several cases previously considered as Osteomyelitis or some other Non-tuberculous infection.

As the length of residence and duration of treatment is a matter of years in the majority of these cases, the work which has been carried on by the Occupational therapist helps in no small part on keeping the patients contented, and their mental attitude, one of cheerfulness and co-operation.

Farm. — The farm has gone through a successful year, producing an abundance of fresh vegetables, fruits, and the entire supply of milk and eggs consumed during the year.

The herd was retested this fall, and no reactor was found. The young stock has been taken care of, during the past summer, on land owned by the Institution, near the coal trestle, and has demonstrated that there is no further need of hiring outside pasture land.

The poultry flock was again tested this year for white diarrhoea by a representative from Amherst College, and showed but a small percentage of reactors.

Opening. — The official opening of this Institution for extra-pulmonary tuberculosis was held on April 27th, 1926. The Institution was visited on that day by over 200 people and appropriate exercises were held in the Assembly Hall, following a buffet luncheon. The exercises were opened by an address by His Excellency, Governor Alvin T. Fuller.

Improvements. — The reconstruction on the Women's and Children's Buildings was completed in the Spring, and both buildings are practically filled to capacity. Work on the reconstruction of the Men's Building has progressed very satisfactorily, and about 50 male patients have already been admitted.

The work on the new water system to supply the Institution with water from Clear Pond is rapidly nearing completion, and should be in operation within a few weeks.

Further additions have been made to our fire equipment; considerable old wiring in the buildings has been replaced by more modern and approved methods, which should lessen the fire hazard considerably. Monthly fire drills have been held.

Recommendations. — It was necessary to purchase large amounts of medical supplies and equipment during the past year to meet the demand of the new type of service required by the many orthopedic cases admitted. The need of a proper location for this equipment has shown how necessary it is that a Central Medical Building be provided, to properly house and furnish adequate space for operating facilities, laboratories for bacteriological, X-ray, fluoroscopic and photographic work, together with a plaster room for making shells, and other forms of orthopedic apparatus. This need was also noted in the report of last year.

In the past few months we have had several cases of Pertussis among the patients in our Children's Building. We have been unable to stop the spreading of this disease, due I believe, to our lack of facilities for the proper isolation of patients suffering from contagious diseases. This need should be met by providing space for isolation, in one end of a Central Medical Building.

Provisions should be made on the second floor of this building for nurses' quarters, as we are already overcrowded in our present quarters for both male and female employees. It has been very difficult to keep nurses, especially for night duty, as the rooms now occupied by the nurses are over the wards, and the noise from the children patients in the early morning and during the day, has made it very difficult for these employees to get the proper amount of sleep.

The Laundry in which the equipment is old and in a very unserviceable condition, is not able to properly take care of the large increase in the number of pieces sent for cleaning each week. The first floor, on which the washing machine is located is not sufficiently large to accommodate the newer types of machines needed. It is therefore recommended that an addition be built on to the present laundry, and new equipment installed.

A preliminary survey has been made by the Division of Sanitary Engineering for the provision of adequate filter beds for the disposal of sewage. The present sub-soil method of disposal is inadequate to meet the demands at the present time.

A twenty bed unit, known as the South Pavilion, should I believe, be provided with a porch and diet kitchen for the accommodation of extra-pulmonary patients. At a small expense this unit could be increased by ten beds, thereby increasing the capacity of beds for patients to 230. Estimates were included in the budget for 1927 for the above improvements.

Entertainments. — Due to the fact that a large percentage of our patients are confined to the bed, moving pictures have not been held since the latter part of June. It has therefore been necessary that we depend on the radio and certain phases of occupational therapy for the entertainment of our patients. Head phones at each bedside have been provided through the kindness and generosity of certain outside organizations.

Acknowledgments. — Religious services have been held each week, as in the past by Catholic and Protestant Chaplains, and twice each month by the Jewish Chaplain. As the majority of patients are unable to attend services in the Assembly Hall, it has been necessary that a large part of the religious work be carried on in the wards.

To the many friends of the patients and institution, grateful acknowledgment is made for the very generous gifts of toys, books and magazines.

The medical staff and employees have been cooperative and loyal during another hard year, due to the upset condition of wards and living quarters, necessitated by the reconstruction work. They have rendered efficient service, and merit your approval.

Appreciating your helpful advice and cooperation, I am

Respectfully,

LEON A. ALLEY, M.D.,
Superintendent.

VALUATION.

Land.

Grounds, 50 acres	\$7,155 30
Lawns and buildings, 48 acres	535 70
Roads, 2 acres.	
Woodland, 10 acres	1,730 37
Mowing, 34 acres	4,311 81
Tillage, 49 acres.	
Tillage, 30 acres.	
Garden, 19 acres.	
Orchard, 8 acres	611 65
Pasture, 41 acres	1,816 41
Waste and Miscellaneous, 17 acres	942 27
Meadow, pasture and swamp land, 16 acres.	
Coal trestle, 1 acre.	

\$17,103 51

Sewerage system	4,882 00
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\$21,985 51

Buildings.

Institution buildings	\$296,730 00
Farm, stable and grounds	31,022 26
Miscellaneous	103,176 77

\$452,914 54

Present value of all personal property as per inventory of Nov. 30, 1926	13,943 19
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\$466,857 73

POPULATION.

	Males.	Females.	Boys.	Girls.	Totals.
Number received during the year	37	40	55	68	200
Number passing out of the Institution during the year	96	10	8	17	131
Number at end of the fiscal year in the Institution	31	33	54	53	171
Daily average attendance (number of inmates actually present during the year)	44.2383	16.9233	32.7616	32.7315	126.6547
Average number of employees and officers during the year	78.3	27.9	-	-	106.2

EXPENDITURES.

Current Expenditures:	
1. Salaries and Wages	\$98,242 93
2. Clothing	697 07
3. Subsistence	20,465 10
4. Ordinary expense	4,817 94
5. Office, domestic and outdoor expense	45,372 42
	\$169,595 46

Extraordinary expenses:

Permanent Improvements:

New Water System (Chapter 277, Acts 1925, 1926)	\$30,813 60
Alterations on Administration Bldg. (Chapter 211, Acts 1925)	6,482 66
Employees' Building (Chapter 510, Acts 1924)	375 00
Alterations on Children's Pavilion (Chapter 211, Acts 1925)	8,538 54
Alterations on Women's Building (Chapter 211, Acts 1925)	18,647 26
Reconditioning Men's Building (Chapter 79, Acts 1926)	38,679 83
	103,536 89

\$273,132 35

Summary of Current Expenses.

Total Expenditures	\$273,132 35
Deduction of Extraordinary Expenses	103,536 89
	\$169,595 46

Deducting amount of sales	5,451 94
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\$164,143 52

Dividing this amount by the daily average number of patients 126.6547, gives a cost for the year of \$1,295.9923 equivalent to an average weekly net cost of \$24.9229.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Boys.	Girls.	
Patients in the Sanatorium Nov. 30, 1925	88	—	9	5	102
Patients admitted Dec. 1, 1925 to Nov. 30, 1926	37	40	55	68	200
Patients discharged Dec. 1, 1925 to Nov. 30, 1926	96	10	8	17	131
Patients remaining in Sanatorium Nov. 30, 1926	31	33	54	53	171
Daily average number of patients	44.2383	16.9233	32.7616	32.7315	126.6547
Deaths (included in number discharged)	10	1	—	2	13

TABLE 2. — *Civil Condition of Patients admitted.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Boys.	Girls.	
Single	16	15	55	67	153
Married	18	24	—	1	43
Widowed	3	1	—	—	4
Divorced	—	—	—	—	—
	37	40	55	68	200

TABLE 3. — *Age of Patients admitted.*

	ADULTS.		CHILDREN.		Totals.	Percentage.
	Males.	Females.	Boys.	Girls.		
1 to 13 years	—	—	35	47	82	41.
13 to 17 years	—	—	7	8	15	7.50
17 to 20 years	2	—	10	9	21	10.50
20 to 30 years	12	13	3	4	32	16.
30 to 40 years	10	17	—	—	27	13.50
40 to 50 years	10	7	—	—	17	8.50
Over 50 years	3	3	—	—	6	3.
	37	40	55	68	200	—

TABLE 4. — *Nativity and Parentage of Patients admitted.*

	ADULTS.						CHILDREN.						TOTALS.		
	MALES.			FEMALES.			BOYS.			GIRLS.					
	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.
United States:															
Massachusetts	18	6	9	8	1	2	43	14	16	55	13	13	124	34	40
Other New England States	—	—	—	1	1	—	6	3	2	1	2	3	8	6	5
Other States	3	4	3	5	2	3	2	2	1	3	7	9	13	15	16
	21	10	12	14	4	5	51	19	19	59	22	25	145	55	61
Other Countries:															
Albania	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1
Armenia	—	—	—	—	—	—	—	1	1	1	1	1	1	2	2
Austria	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
Azores	2	2	2	—	—	—	—	1	—	1	1	1	3	4	3
Belgium	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1
Canada	5	6	7	6	7	7	2	7	8	2	7	6	15	27	28
China	—	—	—	—	—	—	1	1	1	—	—	—	1	1	1
England	—	1	—	—	—	1	—	—	—	—	1	—	—	2	1
Egypt	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
Finland	—	—	—	1	1	1	—	2	2	—	—	—	1	3	3
Germany	—	1	—	—	1	—	—	—	—	—	—	—	—	2	—
Greece	—	—	—	1	1	1	—	—	—	—	2	2	1	3	3
Ireland	1	6	5	7	11	10	—	5	6	1	4	6	9	26	27
Italy	3	2	2	5	6	6	—	3	2	—	8	7	8	19	17
Korea	1	1	1	—	—	—	—	—	—	—	—	—	1	1	1
Newfoundland	—	—	—	1	1	1	—	—	—	—	—	—	1	1	1
Norway	—	—	—	1	—	1	—	1	1	—	—	—	1	1	2
Poland	1	1	1	—	—	—	—	3	3	1	6	5	2	10	9
Portugal	—	1	1	1	1	1	—	4	4	1	3	3	2	9	9
Russia	2	2	2	2	3	3	—	5	5	1	3	2	5	13	12
Scotland	—	1	1	—	—	1	—	—	—	—	2	2	—	3	4
Spain	—	—	—	—	—	—	1	1	1	—	1	1	1	2	2
Sweden	—	—	—	—	3	1	—	—	—	—	1	1	—	4	2
Syria	—	1	1	1	1	1	—	—	—	—	—	—	1	2	2
Turkey	1	1	1	—	—	—	—	—	—	—	1	1	1	2	2
Unknown	—	—	1	—	—	—	—	2	2	1	3	2	1	5	5
	37	37	37	40	40	40	55	55	55	68	68	68	200	200	200

TABLE 5. — *Residence of Patients admitted.*

	Adults.	Children.	Total.
Allston	—	1	1
Amesbury	—	1	1
Arlington Heights	1	1	2
Attleborough	—	2	2
Boston	29	36	65
Boylston	—	1	1
Bradford	1	—	1
Braggville	1	—	1
Brockton	1	1	2
Brookline	1	1	2
Cambridge	8	3	11
Centerville	—	1	1
Chelmsford	1	—	1
Chelsea	1	2	3
Clinton	1	—	1
Cohasset	1	—	1
Concord Junction	1	—	1
Danvers	—	1	1
Dedham	—	2	2
East Douglas	1	—	1
East Templeton	—	1	1
Everett	—	3	3
Fall River	2	—	2
Falmouth	—	2	2
Fitchburg	—	3	3
Gloucester	—	1	1
Haverhill	—	7	7
Holyoke	—	1	1
Hudson	—	1	1
Ipswich	—	1	1
Lawrence	2	1	3
Lowell	—	8	8
Ludlow	—	1	1
Lynn	2	6	8
Malden	2	1	3
Manchester	—	1	1
Marlborough	1	—	1
Medford	3	1	4
Middleborough	1	2	3
Millbury	—	1	1
Nantucket	—	1	1
Natick	—	1	1
New Bedford	1	1	2
Newbury	—	1	1
Newton	1	1	2
North Adams	1	1	2
Norfolk	—	1	1
Norwood	1	2	3
Pittsfield	—	1	1
Randolph	1	—	1
Reading	—	1	1
Revere	1	—	1
Seekonk	—	1	1
Somerset	—	1	1
Somerville	4	—	4
Southbridge	—	1	1
Springfield	3	—	3
Stoughton	—	2	2
Taunton	—	2	2
Walpole	—	1	1
Waltham	—	1	1
Wareham	—	1	1
Watertown	—	2	2
Webster	—	1	1
Westfield	—	1	1
Williamansett	—	1	1
Worcester	2	2	4
	77	123	200

TABLE 6. — *Occupations.*

	Males.	Females.	Boys.	Girls.	Totals.
Attendant	—	—	1	1	2
Barber	1	—	—	—	1
Bell boy	1	—	—	—	1
Book binder	1	—	—	—	1
Box maker	—	—	—	1	1
Box inspector	—	—	—	1	1
Cashier	—	1	—	—	1
Chambermaid	—	1	—	—	1
Chauffeur	3	—	—	—	3
Child	—	—	15	23	38
Clerk, grocery	—	—	1	—	1
Clerk, office	—	—	—	3	3
Clothing packer	—	1	—	—	1
Cotton mill	4	2	—	—	6
Factory	1	2	—	2	5
Fireman	1	—	—	—	1
Florist	1	—	—	—	1
Home at	—	2	—	4	6
Housemaid	—	2	—	2	4
Housewife	—	24	—	1	25
Laborer	4	—	2	—	6
Laundress	—	1	—	1	2
Machinist	3	—	1	—	4
Meter repairer	1	—	—	—	1
Nursemaid	—	1	—	—	1
Optometrist	1	—	—	—	1
Orderly	1	—	—	—	1
Physician	1	—	—	—	1
Porter	1	—	—	—	1
Poultryman	1	—	—	—	1
Printer	2	—	—	—	2
Reporter	—	—	1	—	1
Revenue officer	1	—	—	—	1
Saleslady	—	1	—	—	1
Salesman	1	—	—	—	1
School	—	—	32	29	61
Seamstress	—	1	—	—	1
Stenographer	1	—	—	—	1
Storekeeper	1	—	—	—	1
Student	1	—	2	—	3
Waiter	1	—	—	—	1
Waitress	—	1	—	—	1
Teamster	1	—	—	—	1
Silver plater	1	—	—	—	1
Superintendent of buildings	—	—	—	—	—
	37	40	55	68	200

Total number of occupations 45, total number of patients, 200.

TABLE 7. — *Stage of Disease on Admission.*

TABLE 7.— <i>Stage of Disease on Admission.</i>							Totals.	Per-centage.		
<i>Pulmonary Cases.</i>					Males.	Females.	Boys.	Girls.		
Minimal	.	.	.	.	1	—	—	—	1	.5
Mod. Advanced	.	.	.	.	9	—	—	—	9	4.5
Advanced	.	.	.	.	3	—	—	—	3	1.5
Unclassified	.	.	.	.	3	1	2	1	7	3.5
(1 Pul. case)	.	.	.	.		
(6 Extra Pul.)	.	.	.	.		
					16	1	2	1	20	—
<i>One Lesion.</i>										
Tb. abscess, brain	.	.	.	.	—	—	—	1	1	.5
Tb. abscess, breast	.	.	.	.	—	—	—	1	1	.5
Tb. abscess, ischio-rectal	.	.	.	.	—	1	—	—	1	.5
Tb. adenitis, cervical	.	.	.	.	2	2	1	12	17	8.5
Tb. ankle	.	.	.	.	1	1	1	1	4	2.
Tb. dactylitis	.	.	.	.	—	—	2	1	3	1.5
Tb. endometritis	.	.	.	.	—	1	—	—	1	.5
Tb. epiglottitis	.	.	.	.	—	1	—	—	1	.5
Tb. hip joint	.	.	.	.	2	2	4	10	18	9.
Tb. ileo-cecal	.	.	.	.	—	—	1	—	1	.5
Tb. kidney	.	.	.	.	—	1	1	1	3	1.5
Tb. knee	.	.	.	.	—	—	8	2	10	5.
Tb. nephritis, bilateral	.	.	.	.	—	1	2	—	3	1.5
Tb. ophthalmia	.	.	.	.	—	—	2	3	5	2.5
Tb. os calcis	.	.	.	.	—	—	1	—	1	.5
Tb. peritonitis, dry	.	.	.	.	2	6	—	8	16	8.
Tb. peritonitis, with effusion	.	.	.	.	1	—	—	1	2	1.
Tb. peritonitis, fibrinous	.	.	.	.	—	1	—	—	1	.5
Tb. sacro-iliac joint	.	.	.	.	1	1	1	—	3	1.5
Tb. shoulder joint	.	.	.	.	—	—	1	—	1	.5
Tb. skin	.	.	.	.	—	—	2	1	3	1.5
Tb. spine	.	.	.	.	6	10	12	9	37	18.5
Tb. symphysis pubis	.	.	.	.	1	—	—	—	1	.5
Tb. wrist	.	.	.	.	1	—	1	—	2	1.
Tb. wrist, post operative	.	.	.	.	1	—	—	—	1	.5
					18	28	40	51	137	—

TABLE 7. — *Stage of Disease on Admission — Concluded.*

<i>Two Lesions.</i>		Males.	Females.	Boys.	Girls.	Totals.	Per-centage.
Tb. adenitis, cervical and fecal fistula		—	1	—	—	1	.5
Tb. adenitis, cervical and Tb. ophthalmia		—	—	—	1	1	.5
Tb. adenitis and Tb. middle ear		—	—	1	—	1	.5
Tb. ankle and sternum		—	—	1	—	1	.5
Tb. dactylitis, Tb. adenitis cervical		—	—	—	1	1	.5
Tb. dactylitis and general adenitis		—	—	1	—	1	.5
Tb. dactylitis and ankle		—	—	—	1	1	.5
Tb. femur and rt. hip joint		—	—	—	1	1	.5
Tb. foot and Tb. ophthalmia		—	—	1	—	1	.5
Tb. kidney, Tb. hip joint		—	1	—	—	1	.5
Tb. kidney and nephrectomy, convalescent		—	1	—	—	1	.5
Tb. knee, and minimal		—	—	1	—	1	.5
Tb. knee and spine		—	1	—	—	1	.5
Tb. knee and ulna		—	—	1	—	1	.5
Tb. hip joint and Tb. kidney		—	1	—	—	1	.5
Tb. hip joint and Tb. spine		—	—	1	—	1	.5
Tb. lungs and sternum		1	—	—	—	1	.5
Tb. nephritis and epididymitis		1	—	—	—	1	.5
Tb. ophthalmia and Tb. hip joint		—	—	1	—	1	.5
Tb. peritonitis with effusion and hydrothorax		—	1	—	—	1	.5
Tb. peritonitis with effusion and splenomegaly		—	—	—	1	1	.5
Tb. spine and hip		—	—	1	—	1	.5
Tb. spine and nephritis		—	2	—	—	2	1.
Tb. spine and sacro-iliac jt.		—	—	—	3	3	1.5
Tb. spine and sacrum		1	—	—	—	1	.5
Tb. spine and Tb. wrist		—	—	1	—	1	.5
		3	8	10	8	29	—
<i>Three Lesions.</i>							
Tb. spine; sacrum and Tb. ophthalmia		—	—	—	1	1	.5
<i>Four Lesions.</i>							
Tb. adenitis, Tb. spine, Tb. hip and peritoneal Tb.		—	—	—	1	1	.5
Tb. knee, Tb. dactylitis, Tb. elbow and wrist		—	1	—	—	1	.5
Tb. spine, Tb. dactylitis and wrist; rachitis		—	—	1	—	1	.5
		—	1	1	2	4	—
<i>Non-Tuberculosis.</i>							
Non-Tuberculosis		—	—	1	2	3	1.5
Arteriosclerosis		—	1	—	—	1	.5
Cervical adenitis		—	—	—	1	1	.5
Congenital deformity		—	—	—	1	1	.5
Fixation left hip		—	—	—	1	1	.5
Osteomyelitis left femur		—	—	—	1	1	.5
Separation of the epiphysis of the head of the right femur		—	—	1	—	1	.5
Septic arthritis hip joint		—	1	—	—	1	.5
		—	2	2	6	10	—
<i>Summary.</i>							
Pulmonary cases		16	1	2	1	20	10.
One Lesion		18	28	40	51	137	68.5
Two Lesions		3	8	10	8	29	14.5
Three Lesions		—	—	—	1	1	.5
Four Lesions		—	1	1	1	3	1.5
Non-Tuberculosis		—	2	2	6	10	5.
		37	40	55	68	200	—

TABLE 8. — *Condition on Discharge.*

	ADULTS.		CHILDREN.		Totals.	Percentage.
	Males.	Females.	Boys.	Girls.		
Arrested	1	—	2	2	5	3.82
Apparently Arrested	4	—	—	1	5	3.82
Quiescent	27	—	1	—	30	22.90
Improved	40	2	3	10	58	44.28
Unimproved	12	—	—	—	12	9.16
Deaths	10	1	—	2	13	9.92
Not Considered	2	—	—	1	3	2.29
Non-Tuberculosis	—	2	2	1	5	3.81
	96	10	8	17	131	

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Fe-males.	Boys.	Girls.	Totals.	LENGTH OF RESIDENCE IN SANATORIUM.				
						Males.	Fe-males.	Boys.	Girls.	Totals.
1 to 2 months	—	—	—	—	—	1	1	—	—	2
2 to 3 months	—	—	—	—	—	—	—	—	1	1
3 to 4 months	—	—	—	—	—	—	—	—	1	1
4 to 5 months	—	—	—	—	—	1	—	—	—	1
9 to 10 months	1	—	—	—	1	1	—	—	—	1
12 to 18 months	1	—	—	—	1	3	—	—	—	3
18 to 24 months	1	—	—	1	2	2	—	—	—	2
Over 2 years	6	—	—	1	7	2	—	—	—	2
Unknown	1	1	—	—	2	—	—	—	—	—
	10	1	—	2	13	10	1	—	2	13

TABLE 10. — *Cause of Deaths.*

	Males.	Females.	Boys.	Girls.	Totals.
Pulmonary Tuberculosis	10	—	—	—	10
Tuberculosis Meningitis	—	1	—	—	1
Tuberculosis Peritonitis	—	—	—	2	2
	10	1	—	2	13

NORTH READING STATE SANATORIUM.

RESIDENT OFFICERS.

CARL C. MACCORISON, M.D., *Superintendent.*EARLE C. WILLOUGHBY, M.D., *Assistant Superintendent.*GERALD H. CARON, M.D., *First Assistant Physician.*THOMAS W. LOFT, D.M.D., *Dentist.*ETHEL M. KNIGHT, *Treasurer and Chief Clerk.*MARION DUFF, R.N., *Superintendent of Nurses.*CLARA J. GILL, *Head Matron.*J. ELLIS DOUCETTE, *Steward.*DANIEL J. SCOTT, *Chief Engineer.*EDWARD J. LEARY, *Farmer.*

REPORT OF THE SUPERINTENDENT.

TO GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the 18th annual report of the North Reading State Sanatorium for the year ending Nov. 30, 1926.

During the year there has been expended \$148,055.39 for maintenance, a gross weekly per capita cost of \$19.48.

There has been collected from miscellaneous sources \$68,872.70 (the total of all collections). Deducting this amount from the gross maintenance expenses leaves a net expense of \$79,182.69. The net weekly per capita cost was \$10.42. There has been collected from private funds \$3,437.72; from cities and towns \$64,735.48. Twenty-five cases were supported wholly or in part by private funds; 244 by cities and towns; and 68 wholly by the State.

There were 106 patients at the Sanatorium at the beginning of the year, and 183 at the close. The largest number present at any one time was 183, and the smallest number 101. The daily average number of patients was 146.06. There were 275 cases admitted during the year, 114 more than last year.

There were 218 cases admitted from cities and towns of over 25,000 population, and 57 from cities and towns under 25,000 population. The average age of patients was 14.46 years. Including deaths, there were 198 cases discharged, and the average duration of residence was 7 months and 23 days. Of those discharged 142 gained 1,572 pounds — an average gain of 11.07 pounds per person. Of the discharges there were 16 Apparently Arrested cases, seven more than last year; 5 Arrested; 53 Quiescent, 19 more than last year; 53 Improved, 35 less than last year; 41 Unimproved. There were 16 patients Not Considered — the duration of treatment being less than one month. There were 12 Deaths — 12 less than last year. There were 53,357 hospital days of treatment.

With the permanent elimination of Camp 3 East and Camp 2 West, and the

temporary emptying of Pavilions B East and West and Pavillion C East during alteration and construction, our census from the beginning of the fiscal year to the time we began to admit children in March was necessarily very low. Consequently our per capita cost was materially increased.

The following table shows the classification on the application blank and our classification on admission.

	Classification on Application Blanks.	Our Classification on Admission.
Bronchial Adenitis	2	37
Hilum Tuberculosis	96	121
Minimal (Incipient)	89	22
Moderately Advanced	71	64
Advanced	10	17
Cervical Adenitis	0	1
Non-Tuberculous (Aortic Stenosis)	0	1
Non-Tuberculous (Lung Abscess)	0	1
Observation	1	0
Unclassified	6	11
	<hr/> 275	<hr/> 275

MEDICAL REPORT.

Consultation clinics have been held monthly during the year at Haverhill, Lawrence, Lowell and Woburn. Eight cases were referred to the Lowell clinic; 34 cases to the Haverhill clinic; 21 to the Lawrence clinic and 9 to the Woburn clinic. 104 cases were referred direct to the Sanatorium. Of the 176 consultation cases examined, 37 were diagnosed as active pulmonary tuberculosis; 6 as inactive pulmonary tuberculosis; 4 as non-pulmonary tuberculosis; 81 hilum tuberculosis and 121 were regarded as needing close observation.

Twenty-two ex-patients returned for examination. Of this number 17 returned once; 4 returned twice, and 1 returned three times.

Our physicians assisted at Underweight School Clinics at Belmont and Stoneham.

The following examinations were made in our laboratory: Sputum Examinations: Positive, 545; Negative, 920; Total, 1,465. Urine Analyses, 568; White Blood Counts, 46; Red Blood Counts, 5; Differential Blood Counts, 3; Guinea Pigs Inoculated, 9; Babcock Milk Tests, 56; Throat Cultures, 27; Other Smears, 15; Widal Tests, 91.

Report of Wassermann Tests.—Positive, 2; Negative, 51; Negative (Kahn Test), 4; Doubtful, 2.

479 X-ray films were made. Of this number 105 were consultation clinic cases or underweight school clinic patients.

DENTAL REPORT.

The dental work has undergone a somewhat radical change since the children arrived. In the coming year an attempt will be made to classify some of the oral conditions seen at examinations, not with any specific intent at present, but chiefly because such a study has not been followed at this Institution with tuberculous children, and it is hoped that as years go on, such a study will increase in significance.

The following table is a summary of the work done during the year:

Oral Examinations.—On Admissions, 262; Re-Examined, 115; Examined in bed, 19.

Operative.—Extractions (five in bed), 69; Deciduous extractions, 117; Post operative irrigations, 8; Cleaning, dark stain and salivary calculus, 130; Gold Fillings, 2; Amalgam Fillings, 203; Cement Fillings, 233; Synthetic Porcelain, 55; Sedative Dressings, 26; Pulp removed, 4; Root Canal dressings, 32; Root Canal fillings, 16; Crowns, 3; Bridges repaired, 1; Dentures, 3; Dentures repaired, 2; Ginival treatment, 84; Smears for Vincent's Angina, 5; Cases which require Orthodontic care, 22; Operative total, 1,411.

Dr. Joseph W. Reddy resigned July 31, 1926, to take up similar duties at the Westfield State Sanatorium. Dr. Gerald H. Caron was appointed to fill the vacancy.

CHILDREN.

Alterations and additions to Pavilions B East and West were completed at the end of the first week of March, and the first complement of children arrived March 8th. Pavilion C East was completed June 5th. During the summer Pavilions B West and C East have been filled to capacity and one-half of Pavilion A West and Camp 1 East have been filled to capacity and one-half of Pavilion A West and Camp 1 West have been occupied by the older children. We still have 25 adult male patients and 15 female patients. There are empty beds in the pavilions occupied by the adult patients, but it is not advisable to fill these beds with the small children.

We find that the children require very much more supervision than the adults. Although skilled nursing is not required, it is necessary to have a larger number of attendants to carry on the work.

Miss Marguerite M. Murlless, a graduate of the Boston School of Physical Education, was engaged in September to supervise the amusements of the children and to carry out corrective exercises. We find, however, that it is impossible for one person to satisfactorily carry out this work for both girls and boys where the ages range from 6 to 16 years.

An ungraded school was opened on October 11, utilizing the chapel or amusement hall for one class room and the reception room on Pavilion B East for the other. Two teachers were engaged to carry on this work. The total enrollment was 110, with an average daily attendance of 93. The grades taught were the first to the eighth. We hope that two of the class rooms in the new school building will be ready for occupancy by the first of January, 1928.

IMPROVEMENTS.

Alterations and additions to Pavilions C East and B East and West were completed in the early spring. A swimming pool for the use of the children was constructed and a playground levelled off south of Pavilion C.

The fire protective system was extended to cover the new schoolhouse, and an additional underground heating main and circulating hot water system laid to supply Pavilions B and C East, Nurses' Hall and Chapel, Pavilions A and B West and the schoolhouse. A 4" water main was laid from the water tank to the schoolhouse, a 75 K.W. unit and additional Ross hot water heater and a motor driven 1½" centrifugal hot water circulating pump was installed in the power plant, and a small addition was made to the garage. A new heat and power line was laid to the farm house, and the shed and kitchen of farm house, centre portions of Pavilions B East and West and the carriage shed at the barn resingled.

RECOMMENDATIONS.

An improved refrigerating system and enlarged ice box, and alterations in kitchen and bake shop are badly needed. The centre portions of East and West Wards should be resingled and rather extensive repairs made on the verandas of Pavilions A East and West.

Alterations in the centre portions of Pavilions A East and West should be made before these buildings are entirely turned over for the occupancy of children.

ACKNOWLEDGMENTS.

The Catholic, Protestant and Jewish chaplains have continued without change, and religious services have been held as usual.

We have received many gifts of magazines, toys, games and books for the children from several individuals, the Junior Red Cross, the Junior Christian Endeavor of North Reading and the Kings' Daughters of Andover.

EMPLOYEES.

Miss Mira B. Ross, our Head Matron, after thirteen years of faithful service, resigned on May 4, 1926. Mrs. Clara J. Gill was appointed to fill the vacancy.

Miss Catherine B. Ryan, Superintendent of Nurses, who had rendered good service for a period of four years in that position, resigned on August 18, 1926.

There have been no other changes in the heads of departments.

To the employees in general I wish to extend my appreciation for their efficient work.

Respectfully submitted,

CARL C. MACCORISON,
Superintendent.

VALUATION.

<i>Land.</i>			
Grounds, 12.32 acres		\$593	45
Lawns and Buildings, 11.57 acres.			
Roads, .75 acres.			
Woodland, 23.16 acres		1,115	62
Mowing, 16.41 acres		790	47
Tillage, 5.45 acres		262	53
Tillage, .51 acres.			
Garden, 4.94 acres.			
Orchard, 3.99 acres		192	20
Pasture, 1.50 acres		72	26
Waste and Miscellaneous, 38.93 acres		1,874	77
Rough Pasture, 8.17 acres.			
Meadow Swamp Land, 30.00 acres.			
Coal Trestle, .75 acres.			
		\$4,901	30
Sewerage system		8,258	31
			\$13,159 61
<i>Buildings.</i>			
Institution Buildings		\$304,954	49
Farm, Stable and Grounds		19,066	59
Miscellaneous		102,798	51
			\$439,979 20
Present value of all personal property as per inventory of November 30, 1926			87,983 82
Grand Total			\$527,963 02

POPULATION.

	Males.	Females.	Totals.
Number received during the year	124	151	275
Number passing out of the Institution during the year	86	112	198
Number at end of fiscal year in the Institution	90	93	183
Daily average attendance (number of inmates actually present during the year)	71.67	74.39	146.06
Average number of employees and officers during the year	49.00	37.09	86.09

EXPENDITURES.

Current Expenditures:		
1. Salaries and Wages	\$75,514	60
2. Clothing	2,432	71
3. Subsistence	50,396	59
4. Repairs Ordinary	3,238	94
5. Office, Domestic and Outdoor Expenses	14,013	05
		\$145,595 89
Extraordinary Expenses:		
1. Permanent Improvement to Existing Buildings		2,459 50
		\$148,055 39

Summary of Current Expenses.

Total Expenditures	\$148,055	39
Deducting Extraordinary Expenses	145,595	89
Deducting amount of sales	144,967	43

Dividing this amount by the daily average number of patients 146.06 gives a cost for the year of \$992.52, equivalent to an average weekly net cost of \$19.09.

STATISTICAL TABLES.

TABLE I. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Sanatorium Dec. 1, 1925	52	54	106
Patients admitted from Dec. 1, 1925, to November 30, 1926, inclusive	124	151	275
Patients discharged from Dec. 1, 1925, to November 30, 1926, inclusive	86	112	198
Patients remaining in Sanatorium November 30, 1926	90	93	183
Daily average number patients	71.67	74.39	146.06
Deaths (included in number discharged)	6	6	12

TABLE II. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Single	112	135	247
Married	12	12	24
Widowed	—	2	2
Divorced	—	2	2
Totals	124	151	275

TABLE III. — *Age of Patients admitted.*

	Males.	Females.	Total.	Per-centage.
1 to 13 years	75	70	145	52.728
13 to 20 years	27	52	79	28.728
21 to 30 years	12	18	30	10.909
31 to 40 years	7	8	15	5.454
41 to 50 years	1	3	4	1.454
51 to 60 years	2	—	2	0.727
Over 60 years	—	—	—	0.000
	124	151	275	100.00

Average Age of Patients, 14.46 years.

TABLE IV. — *Nativity and Percentage of Patients admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.
United States	109	49	55	132	43	50	241	92	105
Massachusetts	98	34	42	121	36	43	219	70	85
Other N. E. States	8	6	8	9	1	5	17	7	13
Other States	3	9	5	2	6	2	5	15	7
Total	109	49	55	132	43	50	241	92	105
Other Countries:									
Albania	—	—	—	—	1	1	—	1	1
Argentina	1	—	—	1	—	—	2	—	—
Armenia	—	1	1	—	1	1	—	2	2
Austria	—	—	—	—	3	3	—	3	3
Brazil	1	—	1	1	—	—	2	—	1
Canada	2	24	19	7	34	31	9	58	50
Denmark	—	2	1	—	—	—	—	2	1
England	3	5	5	2	6	4	5	11	9
Finland	—	1	1	—	3	3	—	4	4
Germany	—	—	—	—	1	1	—	1	—
Greece	1	5	2	—	—	1	1	6	3
Ireland	1	10	16	1	15	19	2	25	35
Italy	3	12	11	2	15	12	5	27	23
Latvia	—	—	—	—	1	1	—	1	1
Lithuania	1	1	1	—	2	2	1	3	3
Madeira	—	1	—	—	2	—	—	3	—
Norway	—	1	—	—	1	1	—	2	1
Poland	—	2	2	—	1	1	—	3	3
Portugal	—	—	1	1	2	4	1	2	5
Russia	1	6	5	2	10	10	3	16	15
Scotland	—	—	—	—	2	2	—	2	2
Sweden	1	1	3	2	4	3	3	5	6
Syria	—	—	—	—	1	1	—	1	1
West Indies	—	1	—	—	1	—	—	1	—
Total Foreign	15	72	69	19	107	100	34	179	169
Unknown	—	3	—	—	1	1	—	4	1
Grand Totals	15	75	69	19	108	101	34	183	170
	124	124	124	151	151	151	275	275	275

TABLE V. — *Residence of Patients admitted.*

Andover, 1	Lowell, 6	Revere, 3
Arlington, 1	Lynn, 9	Salem, 3
Beverly, 2	Malden, 5	Saugus, 1
Boston, 108	Marblehead, 1	Somerville, 7
Cambridge, 4	Maynard, 1	So. Belchertown, 1
Canton, 2	Medford, 4	Stoughton, 2
Chelsea, 2	Melrose, 1	Tewksbury, 5
E. Templeton, 1	Methuen, 7	Wakefield, 3
Everett, 3	Natick, 1	Waltham, 3
Fall River, 19	New Bedford, 2	Winchester, 2
Fitchburg, 8	Newton, 8	Winthrop, 1
Gloucester, 7	Peabody, 5	Woburn, 4
Lawrence, 3	Quincy, 17	Worcester, 2
Leominster, 5	Randolph, 1	Total, 275
Lexington, 2	Reading, 1	

TABLE VI. — *Occupation of Patients admitted.*

	Males.	Females.		Males.	Females.
Auto mechanic . . .	1	—	Milliner . . .	—	1
Cashier . . .	—	1	Mill Operative . . .	1	—
Chauffeur . . .	1	—	Printer . . .	1	—
Clerk . . .	3	3	Salesgirl . . .	—	1
Dishwasher . . .	1	—	Salesman . . .	2	—
Dressmaker . . .	—	1	Student . . .	85	108
Errand boy . . .	1	—	Seamstress . . .	—	1
Factory Worker . . .	—	3	Shoe Worker . . .	—	1
Fireman . . .	1	—	Stenographer . . .	—	1
Gardener . . .	1	—	Telephone Operator . . .	—	3
Housewife . . .	—	13	Waitress . . .	—	2
Houseworker . . .	—	2	Woodcarver . . .	1	—
Laborer . . .	4	—	Woodworker . . .	1	—
Longshoreman . . .	1	—	None . . .	15	10
Machinist . . .	1	—			
Meat Cutter . . .	1	—	Total . . .	124	151
Metal Worker . . .	1	—			

Grand Total, 275.

TABLE VII. — *Stage of Disease on Admission.*

	ADULTS.				CHILDREN (UNDER 17 YRS. OF AGE).			
	Males.	Fe-males.	Totals.	Per-centage.	Males.	Fe-males.	Totals.	Per-centage.
Bronchial Adenitis . . .	—	—	—	—	21	16	37	12.727
Hilum Tuberculosis . . .	—	—	—	—	61	60	121	45.818
Minimal . . .	5	4	9	3.272	3	10	13	4.727
Moderately Advanced . . .	17	28	45	16.774	3	16	19	6.909
Advanced . . .	1	3	4	1.776	4	9	13	4.727
Cervical Adenitis . . .	—	—	—	—	1	—	1	0.363
Non-Tuberculous (Aortic Stenosis) . . .	—	—	—	—	1	—	1	0.363
Non-Tuberculous (Lung Abscess) . . .	—	1	1	0.363	—	—	—	—
Unclassified . . .	—	—	—	—	7	4	11	2.181
Total . . .	23	36	59	22.185	101	115	216	77.815

TABLE VIII. — *Condition on Discharge.*

	ADULTS.				CHILDREN (UNDER 17 YRS. OF AGE).			
	Males.	Fe-males.	Totals.	Per-centage.	Males.	Fe-males.	Totals.	Per-centage.
Arrested . . .	1	2	3	1.515	2	—	2	1.010
Apparently Arrested . . .	—	—	—	—	7	9	16	8.080
Quiescent . . .	11	28	39	19.695	9	5	14	7.070
Improved . . .	11	25	36	18.180	8	9	17	8.585
Unimproved . . .	20	14	34	17.170	—	7	7	3.535
Died . . .	4	5	9	4.545	2	1	3	1.515
Non-Tuberculous (Aortic Stenosis) . . .	—	—	—	—	1	—	1	0.505
Non-Tuberculous (Lung Abscess) . . .	—	1	1	0.505	—	—	—	—
Not Considered . . .	1	2	3	1.515	9	4	13	6.575
Totals . . .	48	77	125	63.125	38	35	73	36.875

TABLE IX. — *Deaths.*

DURATION OF DISEASES.	Males.	Fe-males.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Fe-males.	Totals.
Under 1 month . . .	—	—	—	1	—	1
1 to 2 months . . .	—	—	—	—	—	—
2 to 3 months . . .	—	—	—	1	—	1
3 to 4 months . . .	—	—	—	—	—	—
4 to 5 months . . .	—	—	—	—	—	—
5 to 6 months . . .	—	—	—	—	—	—
6 to 7 months . . .	—	—	—	—	—	—
7 to 8 months . . .	—	—	—	—	—	—
8 to 9 months . . .	—	—	—	1	—	1
9 to 10 months . . .	—	—	—	—	—	—
10 to 12 months . . .	—	—	—	—	1	1
12 to 18 months . . .	—	2	2	—	3	5
18 to 24 months . . .	—	1	1	1	1	2
Over 2 years . . .	6	3	9	—	1	1
Totals . . .	6	6	12	6	6	12

TABLE X. — *Cause of Death.*

	Males.	Females.	Totals.
Tuberculosis of Lungs	15	9	24

RUTLAND STATE SANATORIUM.

RESIDENT OFFICERS.

ERNEST B. EMERSON, M.D., *Superintendent*.
 WILLIAM B. DAVIDSON, M.D., *Assistant Superintendent*.
 MARK H. JORESS, M.D., *Assistant Physician*.
 PAUL DFAULT, M.D., *Assistant Physician*.
 JEAN ALBERT JOANNETTE, M.D., *Assistant Physician*.
 HERMENEGILDE VACHON, M.D., *Assistant Physician*.
 FRANK H. WASHBURN, M.D., *Consulting Surgeon, Non-resident*.
 WILLIAM J. O'CONNOR, D.M.D., *Dentist, Non-resident*.
 MARY A. BOYLE, *Treasurer*.
 DELYA E. NARDI, *Superintendent of Nurses*.
 CORA A. PHILLIPS, *Head Matron*.
 OLIN C. BLAISDELL, *Steward*.
 HARRY U. WENDELL, *Chief Engineer*.
 JOSEPH A. CARROLL, *Head Farmer*.
 MARY E. BELL, *Dietitian*.

REPORT OF THE SUPERINTENDENT.

To DR. GEORGE H. BIGELOW, *Commissioner, Department of Public Health*.

I have the honor to submit the thirtieth annual report of the Rutland State Sanatorium for the year ending November 30, 1926.

During the year there has been expended \$278,535.10 for maintenance, a gross weekly per capita cost of \$15.1110. There has been expended from the special appropriation authorized by Chapter 126, Resolves 1924, \$622.99; from the special appropriation authorized by Chapter 211, Resolves 1925, \$625.37; from the special appropriation authorized by Chapter 347, Resolves 1925, \$732.17; from the special appropriation authorized by Chapter 79, Acts 1926, \$770.46.

There has been collected from miscellaneous sources (the total of all collections), \$248,174.87, an increase of 52.11% over the collection of last year. Deducting this amount from the gross maintenance expense leaves a net expense of \$30,360.23, a net weekly per capita cost of \$1.6471. There has been collected from private sources \$19,746.14; from cities and towns \$55,868.62; from Worcester County \$30,672.50; from Middlesex County \$120,280.00; from the Attorney General \$2,686.96; from the United States Veterans Bureau \$108.95.

Thirty-seven cases were supported wholly or in part from private funds; forty by cities and towns; seventeen wholly by the State; one hundred sixty-six by Middlesex County; fifty-four by Worcester County; twenty-seven by the Tubercular Hospital District of Chelsea, Revere and Winthrop. There were twenty-two cases on which settlement had not been determined.

There were 349 patients in the sanatorium at the beginning of the year, 363 at the close. The largest number present at one time was 372 and the smallest 329. The daily average number of patients was 354.47, an increase of 8.49. There were 464 patients admitted during the year, 49 less than last year; 65 minimal, 131 moderately advanced, 245 far advanced and 23 unclassified. There were 252 admitted from cities and towns of over 25,000 population and 212 from cities and towns under 25,000 population. The average age of patients admitted was 30.88, a decrease of .18. Including deaths there were 450 patients discharged, 63 less than last year, and the average duration of residence was 268 days, 30 days more than last year. Of those discharged 258 gained 2,965.25 pounds, an average gain of 11.49 pounds per person. Of the discharges there were 7 arrested cases, 4 less than last year, 10 apparently arrested cases, 16 less than last year, 181 quiescent cases, 34 less than last year, 50 improved, 60 unimproved and 27 not considered, the duration of treatment being less than one month. There were 13 discharged non-tuberculous. There were 102 deaths, 17 more than last year. There were 129,384 days of treatment, 3,098 more than last year.

The following table shows the classification on the application blank and our classification on admission:

	CLASSIFICATION ON APPLICATION BLANKS.		OUR CLASSIFICATION ON ADMISSION.		PER CENT.	
	1925.	1926.	1925.	1926.	1925.	1926.
Minimal	170	125	71	65	13.84	14.01
Moderately advanced	228	255	142	131	27.68	28.23
Far advanced	60	67	275	245	53.61	52.80
Unclassified	55	17	25	23	4.87	4.96
	513	464	513	464		

During the two years of the County contracts there have been admitted 72 less minimal cases than during the two year period prior to the contracts — approximately 35 per cent. The number of advanced cases admitted has increased from 75 per cent to 81 per cent.

Laboratory Report. — The following is a report of the work done in the laboratory during the year: Urine examinations: Routine, 625; 24 hour specimens, 13; Total, 638. Sputum examinations for the tubercle bacilli: Positive, 2,907; No tubercle bacilli found, 3,927; Total, 6,834. Urine examinations (special): Diabetic acid, 2; Acetone, 2; Quantitative sugar, 3; Kidney function, 1. Blood counts, 37; Guinea Pig inoculations, 18; Cultures, 22; Smears for differentiation of bacteria, 22; Bacteriological examination of milk, 30; Examination of feces, 5; Blood smear for malaria, 1. Widal reactions: *Bacillus typhosus*, 110; *Bacillus paratyphosus* A, 110; *Bacillus paratyphosus* B, 110; Total, 330. Initial cultures made for further examination for *Bacillus Typhosus*: From urine, 87; From feces, 85; Total, 172. Blood drawn for Wassermann Test: Negative, 369; Positive, 9; Doubtful, 6; Total, 384.

Of 363 patients remaining in the sanatorium November 30, 1926, .6% report "no sputum", 77.3% have positive sputum and 22.1% no tubercle bacilli found.

Lectures. — Twenty-four lectures given in bacteriology.

Dentistry. — The following is a summary of the dental work done during the year: Office visits, 2,514; Mouth washes, 268; Amalgam fillings, 240; Cement fillings, 152; Gutta Percha fillings, 240; Temporary fillings, 161; Surgical dressings, 16; Extractions, 421; Post extractions, 268; Vincent's Disease, 12; Gingivitis, 60; Trismus, 1; Abscess Cases, 191; Abscesses treated, 126; Stomatitis, 78; Bed treatments, 60; Bone dissections, 4; Hemorrhages checked, 1; Inlays, 28; Plates repaired, 20; Bridges, 31; Crowns, 40; Extractions under novocaine, 410; Extractions under ethyl chloride, 11; Prophylactics, 261; X-Rays teeth, 66; Pulp treatments, 3; Tuberculous palates, 3; Impacted teeth extracted, 14; Repairs to bridges, 2; Bedside extractions, 24; Genito-urinary Stomatitis, 3; Alveolar Process T.B., 2; Syphilitic Ranula, 6.

X-Ray Report. — X-Ray plates (chest), 750; X-Ray plates (teeth), 66.

Consultation Clinics. — The following tables indicate the work of the Consultation clinics: Number of patients examined, 197; Diagnosis: Tuberculosis, 77; Non-tuberculosis, 52; Observation, 57; Hilum tuberculosis, 11.

197 consultation cases reported for 257 examinations and 23 ex-patients reported for 62 follow-up examinations making a total of 319 examinations at the consultation clinics.

Number of patients examined once, 171; twice, 21; three times, 4; six times, 1.

Number of ex-patients examined once, 18; twice, 4; six times, 1.

Number of physicians referring patients 72.

There were 16 patients admitted to the sanatorium following examinations at the consultation clinics.

The following examinations were made at the Sanatorium: Patients referred by physicians, 144; patients examined at own request, 97; Total, 211. Diagnosis: Tuberculosis, 59; Observation, 57; Non-tuberculosis, 89; Hilum tuberculosis, 6.

211 patients reported for 237 examinations and 163 ex-patients reported for 212 examinations making a total of 449 examinations at the sanatorium.

Number of patients examined once, 199; twice, 10; three times, 2.

Number of ex-patients examined once, 126; twice, 25; three times, 12.

Number of physicians referring patients, 65.

There were 23 patients admitted to the sanatorium following examinations at the sanatorium.

The total of all examinations made during the year, exclusive of routine work was 768.

DR. HALBERT CHARLES HUBBARD.

It is fitting that tribute be paid to the memory of Dr. Halbert Charles Hubbard, Assistant Superintendent, who after a brief illness passed away early in the year.

Doctor Hubbard possessed sterling qualities which endeared him as a physician and friend to his patients and fellow workers. Firm but ever sympathetic, never sparing himself to relieve suffering or to bring cheer; quiet and unobtrusive, he nevertheless made his presence felt. His judgment and counsel were based on a broad knowledge of medicine. Honorable in his dealings with his co-workers, possessing a sense of humor and a well balanced outlook on life, the Rutland State Sanatorium sustains the loss of a real man.

CHANGES IN PERSONNEL.

Dr. William B. Davidson, Senior Assistant Physician, was promoted to the position of Assistant Superintendent.

Dr. Jean Albert Joannette was appointed to the staff Mar. 8, 1926.

Dr. Joseph Muller resigned Sept. 24, 1926 to enter private practice. Doctor Muller was most efficient and conscientious in the performance of his medical duties, and what is our loss is a gain to the community.

The resignation of Dr. Paul Dufault to take place early in the coming year is in hand.

These resignations again emphasize the difficulty, if not the impossibility, of maintaining a medical staff competent to carry on the medical activities which the public has a right to expect and to demand. The one solution of the problem which I can see is that suitable compensation, including quarters, be paid to attract and to hold the physician qualified to be charged with the care of our patients. Present salaries neither attract nor hold in the service the better grade of physicians further than as a means to an end, and that end is either private practice or higher salaried positions in other States.

TRAINING SCHOOL FOR NURSES.

The Training School for Nurses is now entering its nineteenth year and again is an exemplification of practical vocational training for both men and women, as well as a financial asset to the Commonwealth. The following affiliations supplement the course given at the Sanatorium: Cooley-Dickinson Hospital, obstetrics and surgery, Worcester City Hospital, pediatrics and medicine and Worcester State Hospital, mental diseases. There are 35 pupil nurses; 12 seniors, 9 intermediates, 9 juniors and 5 probationers.

The following have been awarded diplomas:

Mary Agnes Forbes
Isabella Freede
Rose Evelyn Argento
Anna Marie Beausoleil
Mary Ruth Doherty
Helen Cecelia Reynolds
Alice Frances Ingersoll
Grace Marie Serafine
Helen Anderson
Hazel Baker
Andrew Dominic Waldron

Miss Ellen E. Murray was appointed Assistant Superintendent of Nurses Feb. 10, 1926 and devotes much of her time to class room and practical instruction.

Miss Mary E. Bell was appointed Dietitian July 1, 1926. She has classes in dietetics and a general supervision of the diets.

Instruction in the training school has been given by members of the Staff supplemented by a course of lectures given by Dr. G. Arnold Rice, Dr. Charles E. Ayers,

and Dr. John O'Meara. Dr. William B. Davidson has given a course of lectures at the Holden District Hospital and at the Heywood Hospital, Gardner, Massachusetts.

PUBLICATIONS.

Dr. Mark H. Joress published the following papers during the year: "The Importance of the History in Tuberculosis," "Rehabilitation of the Tuberculous," and "The Use of Artificial Pneumothorax in the Treatment of Pulmonary Tuberculosis."

Dr. Joseph Muller read the following papers, not yet published: one to the Worcester District Medical Society entitled, "Treatment of Syphilis," and one to the Wachusett Medical Society entitled, "Treatment of Eczema."

RECOMMENDATIONS.

Preliminary plans and estimates are submitted for an employees' building for the housing of 44 employees. It is estimated that \$64,000.00 will be required for the building and \$6,000.00 for furnishings, a total of \$70,000.00. At the present time half the women employees are housed in dormitories or rooms adjacent to or opening into ward corridors, and sharing toilet and locker room facilities with the patients, a condition which is subversive of discipline and a source of friction. Rooms and dormitories now occupied by these employees are needed for the care of sick patients and recreation purposes. The need of rooms for terminal cases is particularly emphasized during the past year as evidenced by 102 deaths as against 53 deaths the year prior to the County contracts. The large wards are not well adapted for the care of so many critically ill patients. Reading and recreation rooms add much to the comfort and contentment of patients, and are, I believe, an essential factor in sanatorium treatment. During the winter months patients are obliged to make use of locker and lavatory rooms for reading and writing. An employees' building will not only relieve intolerable living conditions for women employees, but will, at least, help solve the problem of caring for an increasing number of helpless patients. The plans of this building are substantially the same as those of the building for male employees.

A portable X-ray machine costing approximately \$1,200.00 is needed for use on those cases too ill to be moved to the laboratory.

Five thousand dollars is required for replacement of laundry equipment.

Six hundred dollars is needed for a new silo.

Sixteen hundred dollars is needed for retubing the boilers and four hundred dollars for a cement mixer.

The work on the morgue and refrigeration is in progress and will probably be completed early in the year.

The contract for the sprinkler system was given to the Rhode Island Supply & Sprinkler Company and this work will doubtless be completed early in the coming year.

ACKNOWLEDGMENTS.

Reverend Father McNamara, Reverend Father Smith and Rabbi H. S. Bloom have served another year. Chaplain Thomas Livingston resigned and is succeeded by Reverend Robert French of Rutland. Reverend Milton Robison supplied frequently during the illness of Chaplain Livingston. They have brought, as in past years, comfort and peace of mind to all seeking spiritual consolation.

In closing I wish to acknowledge with gratitude the interest and cooperation of all employees who have contributed their share in the work of the past year. It is the loyalty and spirit of the employees which is the measure of whatever success or efficiency may be attained in an institution.

I am not only mindful but grateful for your confidence, consideration and counsel.

Respectfully,

ERNEST B. EMERSON,
Superintendent.

VALUATION.

Land.

Grounds, 46.837 acres	\$17,071 20	
Lawns and buildings, 36.837 acres.		
Roads, 10.00 acres.		
Woodland, 89.34 acres	3,163 20	
Mowing, 82.06 acres	8,206 00	
Tillage, 26.89 acres	2,689 00	
Tillage, 22.54 acres.		
Garden, 4.35 acres.		
Orchard, 1.64 acres	328 00	
Pasture, 88.04 acres	4,183 55	
Waste and Miscellaneous, 29.92 acres	2,596 20	
Rough Pasture, 5.22 acres.		
Meadow Swamp, 18.22 acres.		
Sewer Beds, 5.98 acres.		
Coal Trestle, .50 acres.		
Sewerage System	15,508 32	
		\$53,745 47
<i>Buildings.</i>		
Institution buildings	\$543,394 74	
Farm, Stable and Grounds	34,275 00	
Miscellaneous	58,437 48	636,107 22
		\$689,852 69
Present value of all personal property as per inventory of November 30, 1926		83,733 95
Grand total		\$773,586 64

POPULATION.

	Males.	Females.	Totals.
Number received during the year	234	230	464
Number passing out of the institution during the year	237	213	450
Number at end of the fiscal year in the institution	187	176	363
Daily average attendance (number of inmates actually present during year)	181.42	173.05	354.47
Average number of employees and officers during the year	121.56	68.71	190.27

EXPENDITURES.

Current expenditures:		
1. Salaries and wages	\$141,934 86	
2. Clothing	281 40	
3. Subsistence	78,958 19	
4. Ordinary repairs	7,491 17	
5. Office, domestic and outdoor expenses	49,869 48	\$278,535 10

Extraordinary expenses:		
1. Permanent improvements to existing buildings	2,750 99	
		\$281,286 09

Summary of Current Expenses.

Total expenditure	\$281,286 09	
Deducting extraordinary expenses	2,750 99	
		\$278,535 10
Deducting amount of sales		1,565 56
		\$276,969 54

Dividing this amount with the daily average number of patients 354.47, gives a total cost for the year of \$781.33, equivalent to an average weekly net cost of \$15.0255.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Sanatorium Nov. 30, 1925	190	159	349
Patients admitted Dec. 1, 1925 to Nov. 30, 1926 inclusive	234	230	464
Patients discharged Dec. 1, 1925 to Nov. 30, 1926 inclusive	237	213	450
Patients remaining in Sanatorium Nov. 30, 1926	187	176	363
Daily average number of patients	181.42	173.05	354.47
Deaths (included in number discharged)	59	43	102

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Single	121	114	235
Married	109	104	213
Widowed	4	12	16
Divorced	—	—	—
	234	230	464

TABLE 3. — *Age of Patients admitted.*

	Males.	Females.	Totals.	Per-centage.
Under 14 years	—	—	—	—
14 to 20 years	34	37	71	15.30
20 to 30 years	86	111	197	42.46
30 to 40 years	56	51	107	23.06
40 to 50 years	39	24	63	13.58
Over 50 years	19	7	26	5.60
Average age	32.56	29.17	30.88	—
	234	230	464	—

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	118	31	33	141	33	37	259	64	70
Other New England States	14	20	13	9	20	17	23	40	30
Other States	14	14	13	13	9	7	27	23	20
Total Native	146	65	59	163	62	61	309	127	120
Other Countries (27):									
Total Foreign	88	166	172	67	164	165	155	330	337
Unknown	—	3	3	—	4	4	—	7	7
Grand Totals	234	234	234	230	230	230	464	464	464

TABLE 5. — *Residence of Patients admitted.*

Place	Number	Place	Number	Place	Number
Acton,	1	Hudson,	5	Sherborn,	2
Arlington,	9	Leominster,	7	Shrewsbury,	2
Ashburnham,	1	Lexington,	2	Somerville,	25
Athol,	2	Lowell,	4	Southborough,	2
Attleboro,	1	Ludlow,	2	Southbridge,	7
Auburn,	1	Malden,	24	South Hadley,	2
Belmont,	4	Marlborough,	12	Springfield,	6
Blackstone,	3	Maynard,	1	Sterling,	1
Boston,	62	Medford,	14	Stoneham,	1
Cambridge,	7	Melrose,	3	Templeton,	1
Chelmsford,	3	Mendon,	1	Tewksbury,	1
Chelsea,	17	Milford,	5	Uxbridge,	3
Chicopee,	2	Millbury,	1	Wakefield,	5
Clinton,	5	Millville,	2	Waltham,	19
Concord,	3	Natick,	4	Watertown,	6
Deerfield,	2	New Bedford,	2	Webster,	14
Dudley,	1	Newton,	10	Westborough,	2
Everett,	21	Northbridge,	10	Westford,	1
Fall River,	3	North Brookfield,	1	Wilmington,	1
Fitchburg,	1	Norwood,	1	Winchendon,	6
Framingham,	10	Oxford,	1	Winchester,	5
Gardner,	14	Petersham,	1	Winthrop,	3
Grafton,	2	Quincy,	1	Woburn,	11
Greenfield,	1	Reading,	4	Worcester,	18
Hardwick,	2	Revere,	14	Woonsocket, R. I.,	1
Holliston,	1	Royalston,	1	Total,	464
Holyoke,	2	Russell,	1		
Hopkinton,	2	Rutland,	2		

TABLE 6. — *Occupation of Cases admitted.*

	Males.	Females.		Males.	Females.
Agent, Insurance	2	—	Manager, Floor	1	—
Architect	1	—	Manager, Store	2	—
Attendant	3	1	Manager, Service Station	1	—
Baker	2	—	Manager, Gas Station	1	—
Barber	4	—	Mechanic	4	—
Bookkeeper	2	4	Merchant	3	—
Brakeman	1	—	Metal Plater	1	—
Bricklayer	2	—	Mill Work	10	5
Butcher	1	—	Millwright	1	—
Cabinet Worker	1	—	Moulder	2	—
Carpenter	6	—	Nurse, Graduate	—	5
Cashier	—	2	Nurse, Practical	—	3
Chauffeur	9	—	Nurse, Student	1	3
Checker (B. & A. R.R.)	1	—	No occupation	—	5
Clerk, Drug	1	—	Officer, Police	1	—
Clerk, Mail	1	—	Operator, Telephone	—	6
Clerk, Office	26	19	Operator, Telegraph	1	—
Confectioner	1	—	Optometrist	1	—
Cook	1	1	Painter	5	—
Cutter, Clothing	1	—	Pharmacist	2	—
Cutter, Stone	2	—	Plumber	2	—
Dancer	1	—	Printer	2	—
Die Maker	1	—	Repairman	1	—
Draftsman	1	—	Salesman	11	—
Dressmaker	—	3	Saleslady	—	2
Electrician	2	—	Seamstress	—	2
Engineer, Civil	1	—	Secretary	1	1
Expressman	1	—	Sheet Metal Worker	1	—
Factory Worker	19	22	Shipper	1	—
Farmer	3	—	Shoe Worker	8	6
Fireman	1	—	Silversmith	1	—
Foreman	3	—	Stenographer	—	8
Gardener	5	—	Student	11	4
General Work	5	2	Superintendent, Ass't	1	—
Guard, Boston Elevated	1	—	Tailor	3	—
Housekeeper	—	5	Teacher	—	6
Housewife	—	88	Teamster	3	—
Housework	—	16	Trainman	1	—
Inspector	1	—	Truckman	2	—
Illustrator	1	—	Typist	—	1
Janitor	3	—	Undertaker	1	—
Junk Collector	1	—	Waiter	2	—
Kitchen Work	—	1	Waitress	—	3
Laborer	12	—	Weaver	4	6
Leather Worker	3	—	Welder	1	—
Machinist	6	—			

Total number of occupations, 91. Number of males, 234; number of females, 230; Total, 464.

TABLE 7. — *Stage of Disease at Admission.*

	Males.	Females.	Totals.	Percentages.
Minimal	29	36	65	14.01
Moderately advanced	73	58	131	28.23
Far advanced	115	130	245	52.80
Unclassified	17	6	23	4.96
	234	230	464	—

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentages.
Arrested	2	5	7	1.56
Apparently arrested	5	5	10	2.22
Quiescent	93	88	181	40.22
Improved	24	26	50	11.11
Unimproved	31	29	60	13.33
Deaths	59	43	102	22.67
Non-tuberculous	9	4	13	2.89
Not considered	14	13	27	6.00
	237	213	450	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Fe- males.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Fe- Males.	Totals.
Under 1 month	—	—	—	8	6	14
1 to 2 months	—	—	—	9	6	15
2 to 3 months	—	—	—	5	5	10
3 to 4 months	—	1	1	5	4	9
4 to 5 months	2	—	2	6	2	8
5 to 6 months	1	1	2	5	3	8
6 to 7 months	1	1	2	2	2	4
7 to 8 months	4	—	4	2	4	6
8 to 9 months	—	1	1	3	2	5
9 to 10 months	2	1	3	3	—	3
10 to 12 months	2	5	7	3	—	3
12 to 18 months	8	11	19	5	3	8
18 to 24 months	8	3	11	2	4	6
Over 2 years	31	19	50	1	2	3
	59	43	102	59	43	102

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Pulmonary tuberculosis	57	43	100
Pulmonary abscess	1	—	1
Carcinoma of lung	1	—	1
	59	43	102

WESTFIELD STATE SANATORIUM.

RESIDENT OFFICERS.

HENRY D. CHADWICK, M.D., *Superintendent.*ROY MORGAN, M.D., *Acting Superintendent.*HEMAN B. CHASE, M.D., *Physician.*JOSEPH W. REDDY, M.D., *Physician.*SAMUEL ISSERLIS, *Dentist.*EMILY B. MORGAN, *Superintendent of Nurses and Matron.*SARA R. SKERRY, *Dietitian.*JOSEPHINE E. FRENCH, *Treasurer.*FLORENCE I. SMITH, *Steward.*BENJAMIN J. SANDIFORD, *Chief Engineer.*WILLIAM G. ATKINSON, *Farmer.*

REPORT OF THE SUPERINTENDENT.

To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the seventeenth annual report of the Westfield State Sanatorium for the year ending November 30th, 1926.

During the year there has been expended \$232,056.24 for Maintenance, a gross weekly per capita cost of \$15.715.

There has been collected from miscellaneous sources \$88,578.83. Deducting this amount from the gross maintenance expense, leaves a net expense of \$143,-477.41, or a net weekly per capita cost of \$9.716. There has been collected from private funds \$2,984.00; from cities and towns \$82,108.90. 18 cases were supported wholly or in part from private funds; 198 by cities and towns; 50 wholly by the state; 13 by the Department of Public Welfare; 39 status undetermined; 2 part city and part state.

We had 287 patients at the beginning of the year and 269 at the close. Our daily average was 283.96. The largest number present was 313, the smallest 247. Total of cases admitted was 320. These were classified as shown in the following table:

	Classification on Application Blank.	Our Classification on Admission.
Bronchial Adenitis	—	39
Hilum Tuberculosis	59	210
Minimal	155	19
Moderately Advanced	40	30
Advanced	5	14
Bone Tuberculosis	2	1
Pulmonary Abscess	—	2
Cervical Adenitis	7	1
Tuberculous Empyema	—	1
Unresolved Pneumonia	—	1
Tuberculous Mastoid	1	—
Non-Tuberculous	—	1
Unclassified	51	1
	<hr/> 320	<hr/> 320

223 cases were admitted from cities and towns of over 25,000 population; 97 from cities and towns of less than 25,000. The average age of patients was 11.68 years. There were 338 discharges. Of these 51 were Apparently Well; 133 Apparently Arrested; 109 Improved; 24 Unimproved; 14 were not considered as they stayed less than 30 days. There were 7 deaths. Of those discharged, 315 gained 3,376 pounds, or an average gain of 10.7 pounds. There were 103,649 hospital days of treatment.

COMMENT.

Our gross per capita cost has been \$1.13 per week higher than the previous year. This is accounted for by the fact that we have had several vacancies during a good part of the year. Our collections have been higher this year so that the net per capita remains practically the same as the year before. The average age of patients admitted is one year higher than the previous year, due to the fact that we have admitted a few women to the institution. Except for the women, we have admitted younger children than usual, which accounts for the smaller average gain in weight.

CLINICS.

We have held 23 examination clinics in Hampden County; 2 in Franklin, and have assisted Dr. O'Brien at one clinic in Hampshire County. Consultation clinics have been continued as usual, but in November the clinic in Holyoke was discontinued. Holyoke is so near to Westfield that the doctors preferred to send their patients directly to the sanatorium. The results of our Clinic and Out-Patient work are shown in the following table:

	Positive.	Negative.	Suspicious.	Re-examined.	Total.
1. Consultation Clinics	29	38	14	25	106
2. Examination Clinics	11	502	157	359	1,029
3. Out-Patients	105	268	48	100	521
	<hr/> 145	<hr/> 808	<hr/> 219	<hr/> 484	<hr/> 1,656

This table shows that 145 new cases of tuberculosis were diagnosed, or 8.7% of the total number examined.

Out-Patient X-Rays 719

DENTIST'S REPORT.

The following is a report of the dental work performed at the clinic of the Westfield State Sanatorium for the year 1925-1926. During this time a total of 3,292 operations were performed for the benefit of the patients. The aggregate would indicate that on an average each patient at the institution has been to the clinic for necessary dental work five or six times during the year. The total number of operations includes the following: Examinations, 563; Prophylaxis, 476; Extractions, 121; Deciduous Extractions, 289; Injections, 226 (Procaine); Devitalizations, 14; Root Canal Dressings, 46; Root Canal Fillings, 13; Amalgam Restorations, 64; Amalgam Fillings, 414; Cement Fillings, 457; Sedative Fillings, 308;

Gutta-Percha Fillings, 144; X-Rays, 18; Irrigation, 12; Ethyl Chloride, 58; Treatments, 42; Gold Filling, 1; Plate repair, 1.

Examinations. — Each patient soon after arriving comes to the clinic for oral examination. The conditions are noted, and at this appointment the mouth is given a thorough prophylaxis (cleaning); the patient at this time is also personally instructed in the use of the toothbrush and value of oral hygiene. At subsequent appointments, corrective work is done.

Extractions. — All teeth beyond hope of repair, such as many with advanced caries and pulp exposures, others abscessed and putrescent; those with which the patient has suffered pain (odontalgia), and badly infected roots, are extracted as soon as possible. This is done painlessly by the use of conduction anesthesia and ethyl chloride. In the past year it has been necessary to use a general anesthetic in only one case.

Cavity Preparation and Fillings. — Whenever it is possible to do so, teeth having cavities varying in degree from the fissure cavity of first degree to those in which the pulp is practically exposed, fillings are inserted. In some cases the cavities are prepared under local anesthesia. Fillings of amalgam, cement and sedative material are used wherever each is indicated.

Treatments. — A most common manifestation in the mouths of the patients is known as Gingivitis or "swollen bleeding gums". As this is a forerunner of pyorrhea, which would undoubtedly result in years to come, the present day prophylactic measures are used. These cases are treated by scaling and probing and such medicinal applications to the gums as seem advisable. They are instructed especially in the correct method of brushing the teeth and gums and the value of "home" treatment. Patients unable to come to the clinic are visited and treated in the wards.

In conclusion I wish to mention Miss O'Brien, who has included in her course of instruction talks to the children on the value of oral health which have helped the dental program considerably; also Miss Macdonald for her assistance and attention which at times it has been necessary to enlist.

SANATORIUM SCHOOL.

Average Daily Attendance, December 1925 to December 1926.

Grade I	.	.	.	.	.	.	.	.	.	22.73
Grade II	.	.	.	.	.	.	.	.	.	20.34
Grade III	.	.	.	.	.	.	.	.	.	23.67
Grade IV	.	.	.	.	.	.	.	.	.	25.17
Grade V	.	.	.	.	.	.	.	.	.	23.82
Grade VI	.	.	.	.	.	.	.	.	.	25.21
Grade VII	.	.	.	.	.	.	.	.	.	26.63
Grade VIII	.	.	.	.	.	.	.	.	.	19.62
Manual Training	.	.	.	.	.	.	.	.	.	25.30
										<hr/>
Total Average	.	.	.	.	.	.	.	.	.	212.49
Total Enrolment	.	.	.	.	.	.	.	.	.	477

IMPROVEMENTS MADE DURING THE YEAR.

The Staff Dining-Room was enlarged at an expense of \$1,250. An addition was built to the Recreation Room of the East Ward at a cost of \$2,250. The Carpenter Shop was completed. This has released space for the enlargement of our Store-room. This has been re-arranged and enlarged so that our store-room facilities are greatly increased. A new Record Room for the State Clinic work has been completed and is now in use. Other new work has been in the nature of ordinary repairs and renewals.

Power House. — In December 1925, our Power Plant was practically put out of commission through the bagging of our boilers. A special appropriation was granted to remedy this condition. Under the direction of the Consulting Engineer, the Power House has been enlarged; one new 200 H. P. Boiler has been installed and is now in operation; the old boilers have been patched, and our Power House

Summary of Current Expenses.

Total expenditure	\$232,056 24
Deducting extraordinary expenses	9,268 51
	\$222,787 73
Deducting amount of sales	2,927 42
	\$219,860 31

Dividing this amount by the daily average number of patients, 283.96 gives a cost for the year of \$774,265, equivalent to an average weekly net cost of \$14.889.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1925 to Nov. 30, 1926, inclusive	147	173	320
Number of patients discharged Dec. 1, 1925, to Nov. 30, 1926, inclusive	167	171	338
Number of deaths (including those in previous items)	1	6	7
Number in Sanatorium Dec. 1, 1925	140	147	287
Number remaining Nov. 30, 1926	120	149	269

TABLE 2. — *Civil Condition of Patients admitted.*

	Males.	Females.	Totals.
Single	147	165	312
Married	—	7	7
Divorced	—	1	1
	147	173	320

TABLE 3. — *Ages of Patients admitted.*

	Males.	Females.	Totals.
1 to 13 years	102	100	202
14 to 20 years	45	57	102
21 to 30 years	—	9	9
31 to 40 years	—	5	5
41 to 50 years	—	1	1
51 to 60 years	—	1	1
	147	173	320

TABLE 4. — *Nativity and Parentage of Patients admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	115	40	49	135	47	52	250	87	101
Other N. E. States	8	9	12	7	10	7	15	19	19
Other States	12	18	10	10	15	12	22	33	22
Total Natives	135	67	71	152	72	71	287	139	142
Other Countries:									
Africa	—	—	—	—	1	—	—	1	—
Armenia	—	1	1	—	—	—	—	1	1
Austria	—	3	3	—	1	1	—	4	4
Azore Islands	—	—	1	—	—	—	—	—	1
Canada	4	17	16	9	17	24	13	34	40
Czecho-Slovakia	—	—	—	—	1	—	—	1	—
Denmark	—	—	1	—	—	—	—	—	1
England	—	1	3	1	2	1	1	3	4
Finland	—	1	1	1	2	2	1	3	3
France	—	—	1	—	—	—	—	—	1
Greece	2	3	3	—	7	1	2	10	4
Holland	—	2	—	—	—	—	—	2	—
Hungary	—	—	—	—	1	1	—	1	1
Ireland	—	9	7	2	15	17	2	24	24
Italy	1	14	10	2	11	11	3	25	21
Lithuania.	—	2	2	—	4	3	—	6	5
Poland	1	11	12	1	24	23	2	35	35
Portugal	—	1	1	—	—	1	—	1	2
Russia	—	8	7	1	2	2	1	10	9
Scotland	1	—	1	—	3	2	1	3	3
Spain	—	—	—	—	1	1	—	1	1
Sweden	—	—	—	—	1	1	—	1	1
Syria	—	—	—	—	2	2	—	2	2
Unknown.	9	73	70	17	95	93	26	168	163
	3	7	6	4	6	9	7	13	15
	12	80	76	21	101	102	33	181	178
	135	67	71	152	72	71	287	139	142
	147	147	147	173	173	173	320	320	320

TABLE 5. — *Residence of Patients admitted.*

Adams, 3	Harvard, 1	Reading, 1
Attleboro, 1	Hinsdale, 2	Revere, 1
Barnstable, 1	Holyoke, 13	Rutland, 2
Boston, 45	Hudson, 1	Sherborn, 2
Braintree, 1	Lancaster, 1	Somerville, 4
Brookline, 1	Lee, 1	Southborough, 1
Cambridge, 4	Leominster, 4	Southbridge, 1
Canton, 1	Lowell, 2	South Hadley, 1
Chelsea, 2	Lynn, 9	Southwick, 1
Chicopee, 10	Malden, 4	Springfield, 41
Clinton, 2	Medford, 2	State Minor Wards, 12
Dalton, 2	Melrose, 2	Tewksbury, 3
Dedham, 1	Methuen, 4	Worcester, 28
Dudley, 2	Milford, 3	Walpole, 2
Easthampton, 1	New Bedford, 1	Westfield, 12
East Hartford, Conn., 1	Newton, 1	Woburn, 1
East Longmeadow, 1	North Adams, 4	Winchendon, 1
Everett, 1	Northampton, 2	Webster, 2
Fall River, 7	Northborough, 1	Waverly, 3
Fitchburg, 5	Orange, 1	Washington, 1
Florence, 1	Palmer, 3	West Springfield, 5
Framingham, 1	Pittsfield, 24	Westport, 1
Gardner, 2	Prescott, 1	Watertown, 1
Gloucester, 1	Providence, 2	Total, 320
Greenfield, 2	Quincy, 5	

TABLE 6. — *Occupation of Cases admitted.*

	Males.	Females.	Totals.
Bookkeeper	—	1	1
Bootblack	1	—	1
Dressmaker	—	2	2
Factory	1	4	5
Hairdresser	—	1	1
Housekeeper	—	7	7
Pupil Nurse	—	1	1
Stenographer	—	1	1
School	145	152	297
Telephone Operator	—	2	2
Waitress	—	2	2
	147	173	320

TABLE 7. — *Stage of Disease on Admission.*

	Males.	Females.	Totals.	Percentages.
Bronchial Adenitis	20	19	39	12.19
Hilum Tuberculosis	110	100	210	65.63
Minimal	6	13	19	5.94
Moderately Advanced	4	26	30	9.38
Advanced	3	11	14	4.38
Bone Tuberculosis	1	—	1	.31
Tubercular Empyema	1	—	1	.31
Cervical Adenitis	1	—	1	.31
Pulmonary Abscess	—	2	2	.62
Non-tubercular	—	1	1	.31
Unresolved Pneumonia	—	1	1	.31
Not Classified	1	—	1	.31
	147	173	320	100.00

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentages.
Apparently Well	30	21	51	15.09
Apparently Arrested	76	57	133	39.35
Improved	49	60	109	32.251
Unimproved	8	16	24	7.08
Not Considered	3	11	14	4.16
Died	1	6	7	2.07
	167	171	338	100.00

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	—	—	—	—	—	—
1 to 2 months	—	—	—	—	—	—
2 to 3 months	—	—	—	—	1	1
3 to 4 months	—	1	1	—	—	—
4 to 5 months	—	—	—	1	—	1
5 to 6 months	—	—	—	—	1	1
6 to 7 months	—	—	—	—	—	—
7 to 8 months	1	—	1	—	—	—
8 to 9 months	—	1	1	—	—	—
9 to 10 months	—	—	—	—	—	—
10 to 12 months	—	—	—	—	2	2
12 to 18 months	—	2	2	—	—	—
18 to 24 months	—	—	—	—	—	—
Over 2 years	—	2	2	—	2	2
	1	6	7	1	6	7

TABLE 10. — *Cause of Death.*

CAUSE.	Males.	Females.	Totals.
Tuberculosis of the Lungs	1	6	7

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THIRTEENTH ANNUAL REPORT

OF THE

Department of Public Health of Massachusetts

REPORT OF THE PUBLIC HEALTH COUNCIL.

At the end of the fiscal year closing November 30, 1927, the State Department of Public Health was constituted as follows:

Commissioner of Public Health GEORGE H. BIGELOW, M.D.

PUBLIC HEALTH COUNCIL.

GORDON HUTCHINS, 1928.

SYLVESTER E. RYAN, M.D., 1928.

FRANCIS H. LALLY, M.D., 1930.

RICHARD P. STRONG, M.D., 1929.

ROGER I. LEE, M.D., 1930.

JAMES L. TIGHE, B.A.Sc., C.E., 1929.

During the year fourteen formal meetings of the Department were held, as well as meetings of standing committees. The standing committees of the Council are as follows:

SANITARY ENGINEERING (INCLUDING HOUSING AND RURAL HYGIENE).

Mr. Tighe, Dr. Bigelow and Mr. Hutchins.

PREVENTIVE MEDICINE AND HYGIENE.

Drs. Lee, Bigelow, Lally, Ryan and Strong.

FOOD AND DRUGS.

Drs. Lally and Ryan and Mr. Hutchins.

LABORATORY WORK AND RESEARCH.

Drs. Strong and Bigelow and Mr. Tighe.

PUBLICATIONS.

Drs. Lally and Ryan and Mr. Tighe.

The Committee on Sanitary Engineering has met prior to the meeting of the Public Health Council regularly, as is customary, and has considered in detail all matters coming before the Department having to do with water supplies, sewage disposal and sanitation generally, subsequently submitting recommendations thereon to the Public Health Council.

The policy has been adopted of having at least two meetings of the Council held at the various hospitals under the direction of the Department. This year these were held at the North Reading and Westfield State Sanatoria. This gives an opportunity for a review of the work and the problems of the institutions. Also the Council attended the opening in June of the Pondville Hospital at Norfolk for cancer and visited the Metropolitan sewer outlets in Boston Harbor as well as certain areas around Quincy Bay about which complaints had been received of certain objectionable conditions existing.

As provided by statute the Department has held twelve public hearings on plans for sewerage and sewage disposal, taking of lands for the protection of public water supplies and an appeal from action of a local board of health in refusing to grant permission to sell certain milk. The Public Health Council has considered and approved appointments submitted to it by the Commissioner as required by law, and has also considered and given advice relative to various matters submitted to it by the Commissioner arising in connection with the activities of the Department.

As directed by Chapter 391, Acts of 1926, the Department has opened the Pondville Hospital at Norfolk for the treatment of all forms of cancer, and has purchased approximately a gram of radium, as authorized by Chapter 328, Acts of 1927, for use at this hospital.

Under the authority of Chapter 259, Acts of 1927, the Department promulgated rules and regulations for the licensing by the local health authorities of all pasteurizing plants.

Chapter 30 of the Resolves of 1927 directed the Department to still further investigate the water supply needs for the cities and towns of Essex County and adjacent sections of Middlesex County. This study has been made and a report submitted.

Under the authority of Chapter 42 of the Resolves of 1927 the Metropolitan District Commission and this Department jointly have studied and reported on the taking of water from the Charles River Basin for fire protection and sale for manufacturing purposes.

As authorized by Chapter 33 of the Resolves of 1927 the Department of Conservation requested the Department to assist in a study of the feasibility and practicability of rendering shellfish taken from contaminated areas safe for use as food by means of disinfection or otherwise and this Department has made a report to the Department of Conservation.

As directed by Chapter 32 of the Resolves of 1927, the Commissioner of Public Health, acting jointly with the Commissioners of Mental Diseases and the Metropolitan District Commission, has studied the problem of sewage disposal from the proposed Metropolitan Hospital in Waltham, Belmont and Lexington.

At a meeting of the Department on January 10, 1928, the Commissioner of Public Health presented to the Council a report of the activities of the Department for the fiscal year 1927, and it was voted that this report, together with the foregoing brief summary of the doings of the Public Health Council, be approved and adopted as the report of the State Department of Public Health for the year 1927.

THIRTEENTH ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC HEALTH.

To the Public Health Council:

GENTLEMEN: — I have the honor to submit herewith my annual report for the fiscal year ending November 30, 1927.

There are certain outstanding matters in disease prevalence, causation and control practice during the past year that may well be enumerated: The occurrence of 1189 cases of anterior poliomyelitis during the calendar year (all disease figures will be given for the calendar rather than the fiscal year), which next to 1916 is the highest prevalence of this disease ever recorded in this State; the opening of the cancer hospital, local cancer clinics, and the initiation of extensive cancer education; the fall flood in the Connecticut Valley and west; the shortage of 1,000 beds for the tuberculous in city and county institutions where a few years ago we felt the number of beds to be adequate; the lowest death rate that the State has ever had from typhoid fever (1.0 deaths per 100,000 population), the increased realization of the importance of the carrier in the spread of this disease, and the total lack of authority vested in health officers to identify carriers, much less control them; the promulgation by the Department of revised minimum quarantine requirements which had been approved by the Massachusetts Association of Boards of Health and which are being quite generally adopted by the local boards of health; the improved protection of the milk supply through the enforcement of the pasteurization plant licensing law passed at the last session; the doubling of the size of the Biological Laboratory after many years of inadequate quarters; the quite general increase in diphtheria prevalence which was anticipated following the phenomenally low prevalence of the two preceding years; the growing appreciation of the movement to increase the physical fitness of the children about to enter school; the sudden alarming increase in rabies among dogs during the latter half of the year; the clumsiness and inadequacy of the shellfish supervision as at present vested in the Department with lack of complete satisfaction from either the health or industrial aspects; the unsolved problem in this State of how adequate public health service according to present standards can be made available to the 283 towns of less than 10,000 people. These points will be elaborated in this report and in those of the Division Directors which follow.

I — COMMUNICABLE DISEASE.

This calendar year there were 83,817 cases of communicable disease reported as compared with 100,375 cases in 1926 or a decrease of 16.5 per cent. The principal increases were in infantile paralysis, scarlet fever (mostly mild), diphtheria, mumps and dog-bites, while the most striking decreases were in influenza, measles, whooping cough and typhoid fever.

Minimum Quarantine Requirements. — It is pretty generally conceded that quarantine alone has not protected the public against the common diseases spread by the upper respiratory tract. These include the prevalent communicable dis-

eases of childhood. This being so, the ultimate solution must come with active immunization such as we already have in diphtheria. But while our knowledge is limited and our application of that knowledge is still more so, we must do what we reasonably can to protect the individual through quarantine. It is fair to say that except in cases of general public alarm quarantine will be no more effective than the public cares to make it, however the health officers may rave.

It is also generally true that the shorter the quarantine interval and the fewer the times the individual family is called on to cooperate, the greater will be the degree of cooperation. This being true, the Department in its Minimum Rules for the Control of Communicable Diseases has included the shortest intervals that present knowledge and sound practice would indicate. Perhaps the most radical recommendations are that contacts with chicken pox, German measles and mumps shall not be quarantined, neither shall these diseases be placarded. It was felt that respect for quarantine should be maintained for the more killing and maiming diseases such as measles, whooping cough, scarlet fever and the like. The Massachusetts Association of Boards of Health recommended that these same rules be adopted, and this has been done by many cities and towns. Much confusion will be avoided when they have become universal throughout the State.

Typhoid Fever. — If, as has been said, a health officer's efficiency can be judged by his typhoid rate the rest of the country may look to the local health officers of Massachusetts with envy. This year the death rate of 1.0 per 100,000 population is the lowest, so far as we know, ever obtained by any State in the Union. Of course, individual cities have had lower rates. However, complacency is not in order even with this disease, since well over a million of our people are served raw milk daily, many more eat food three times a day handled by thousands of food handlers, many of whom have no respect for the rudiments of personal cleanliness. There are not a few inadequately protected water supplies. There is the almost universal practice of introducing into our factories as an auxiliary supply a polluted water, a condition which we have been studying this last summer. Finally, there is the menace of the great outbreaks of this disease in adjacent communities, like Montreal. Here well over 4,500 cases were traced to milk passing through a pasteurizing plant *raw*. At a conservative estimate there will be 200 recovered persons who are permanent carriers of the disease with an average life expectancy of some 40 years. This is equivalent to one person being able to spread the disease for 8,000 years. Some of these will come to Massachusetts and handle our food. Surely Montreal menaces Massachusetts.

This year there have been three outbreaks traced to carriers, one a milker, one handling food at a church supper, and one working in a school kitchen. Local boards are more generally requiring that cases of typhoid fever be discharged only on laboratory examination. Since all carriers were at one time cases, by this method most of the new carriers would be detected. In response to a general request addressed to the dairy industry, many samples of stools and urine were sent for examination. The form application for a pasteurization plant license requires information as to past history of typhoid among the workers. Certain local health officers, notably in Fall River, have been furthering the examination of restaurant workers as well as milk handlers. Through our District Health Officers the Department has checked up all carriers identified in the past and with the special attention given this matter by our Epidemiologist has discovered 16 new carriers, making the total of known carriers 60. But there are presumably 2,000 carriers in the state on the basis of the number of cases reported in the past 20 years, and considering that at least five per cent become permanent carriers.

At present if a suspected individual refuses to submit specimens of blood, urine and feces, his carrier state cannot be proved or disproved. We have records of about 170 persons so refusing to cooperate. At the last session of the Legislature a bill authorizing examination of suspected persons and control of proved carriers who refused to cooperate in protecting the public was not passed. Fourteen states have such authority. This year we are asking authority for any health officer to examine any food handler on suspicion of any communicable disease or carrier condition. This would seem the irreducible minimum of authority for any control program. Wholesale examination of all food handlers which is theoretically sound, does not give a protection commensurate with the great expenditure,

and may give a false sense of security. Such examinations should be made by individual employers interested in protecting their product from the disaster of disease.

This year three carriers, all professional milk handlers, have had their gall bladders removed at the expense of the Department. These persons had all been carriers for some time, had all caused sickness, and all showed positive duodenal cultures. Fecal examinations have shown no typhoid bacilli in any of these post-operative cases. If at the end of a year duodenal as well as stool examinations are still negative these individuals can presumably handle food safely as far as typhoid fever is concerned and they will be given a statement to that effect. For the professional food handler who has no other occupation to which he can turn this seems the only solution, and is a sound expenditure of public funds, since it removes a public menace. The operation can, of course, be performed only with the entire consent of the carrier, but he benefits since the threat of gall stones, almost universal in typhoid carriers, is removed.

A statistical study of typhoid fever from 1850 has been made by our Statistical Consultant, Dr. Carl R. Doering, and is published elsewhere in the report. Contrary to experience elsewhere, and except for our three largest cities, the typhoid rate increases with density of population. Since carriers now play so large a part in spread, their contacts should generally increase with the congestion of population. Control of the environment is a large factor in control of this disease. Any gross breakdown of such control should be registered by an excessive fluctuation from the trend of the disease. No such excessive fluctuation has occurred, the decrease in death rate having been quite constant. It is pointed out statistically, as has been suspected, that the typhoid rate in this State is to a certain degree dependent on that of neighboring states through importation. Some interesting observations are made on the decrease in the proportion of deaths from this disease in the higher age groups since 1850. Was there possibly a lower incidence previous to available statistics which accounted for a highly susceptible group over 60, and with our continued drop will we again create such a susceptible population with corresponding increased incidence in this age group in the future? This is mere speculation but if it should be so, a rise in incidence of the disease among the increasingly susceptible older age groups can be controlled through further control of the carrier and recourse increasingly to artificial immunization through vaccine.

This year enough vaccine was distributed to immunize 35,470 persons. For the traveler and the vacationist this protection should be regularly employed, and since this disease still kills appreciably and causes prolonged sickness, and since any protection against the carrier, who largely stalks unnoticed in our midst, will be incomplete, it should be seriously considered by those remaining at home.

Tuberculosis. — The county and city hospitals for tuberculosis show 1,000 beds less than are needed on the basis of one bed for every annual death from this disease. Yet five years ago the Department felt that the number of beds was adequate to meet the demands. What has happened? During this interval two State sanatoria have been withdrawn from service to adult pulmonary tuberculosis, the North Reading institution now serving children, and the Lakeville institution now serving non-pulmonary cases. This took away about 400 beds. Again, five years ago 35 per cent of all pulmonary cases were demanding hospital care. Now 53 per cent are demanding such care. Under such circumstances with a decreasing prevalence of the disease the hospital demands may increase. This increase accounts for over 500 beds. To meet this and because of the constant waiting list for admission to the Rutland State Sanatorium, the Department has refused to renew its contract for service at this sanatorium to the hospital districts of Middlesex and Worcester Counties. When these counties provide the 375 beds which are indicated, when Boston increases its beds as tentatively planned, when some of the other counties make the additions needed, and the whole 350 beds at the Rutland State Sanatorium are available to the entire State, the 1,000 bed need will be approximately met.

A study of the first 50,000 children examined in the school clinics under the Ten-Year Juvenile Tuberculosis Program during the first three years suggests that certain infected children are being missed by examining only the contacts and

underweights. Thus this year an effort is being made to examine all children in the grade schools. This will presumably mean that instead of 15 per cent about 60 per cent will actually be examined. Our examinations show that from the ages of five to seven the proportion of infected children about trebles. Is this because of age susceptibility, or is there something inherent in our school system to which all children must submit, that accounts for this? Surely from this Ten-Year Program we have much to learn.

The 500 beds at Westfield and North Reading largely occupied by children discovered in our school clinics have been filled. The County Tuberculosis Hospitals may now give preventorium service which is so much needed by this group. The follow-up work in schools and homes is done with varying degrees of adequacy. In the Boston schools an excellent system of open window classes giving extra rest and nourishment has been devised at minimum cost and minimum interference with school routine. The tuberculosis clinic service in the various cities has been studied and varies from excellent to grossly inadequate. Where local clinicians with special interest and time are not available, this preeminently important service can probably most effectively be given from the various sanatoria. But as this grows it will inevitably mean growth of sanatoria staff.

The Lakeville State Sanatorium for non-pulmonary tuberculosis has a waiting list. More beds are needed to increase the capacity to 300. As the overturn of these cases is slow, the stay varying from two to five years, at best the pressure will be very acute before an increase in capacity is made available. With the opening of the medical building surgery can now be combined with helio-therapy and the service to the patients can meet the most exacting demands. Preliminary studies in the sanatorium laboratory indicate that some twenty-five per cent of the children have been infected with bovine tuberculosis. This gives added impetus to the legislation which would eventually exclude from sale all raw milk from cows that have not been found uninfected by the tuberculin test.

Anterior Poliomyelitis (Infantile Paralysis). — This year 1,189 cases of anterior poliomyelitis were reported. Through a cooperative arrangement with the Harvard Infantile Paralysis Commission the services of a clinician were retained for diagnostic work and the administration, in selected cases, of convalescent serum. The Commission has expanded its excellent after-care clinics to cover the particularly affected areas in the northeastern part of the State. The results of epidemiological studies, serum therapy and after-care are being worked up for publication. While the serum must largely come from children, even with the fullest possible cooperation, its supply will be sharply limited and cannot be as generally available as are biologicals prepared from laboratory animals.

Veneral Diseases. — This year arrangement has been made under a five-year contract for the purchase instead of the manufacture of arsenicals for the treatment of syphilis. A very favorable rate at less than half our production cost was obtained though there were few companies willing to bid on such a long term contract. A similar contract for biologicals will be suggested, but experience in other states has invariably shown that short contracts with steadily increasing rates are the rule.

Dr. William A. Hinton of our staff has devised a serological test for syphilis which may well prove to be simpler and more economical than the Wassermann. A real need that is felt is a reorganization of the program of the Massachusetts Society for Social Hygiene so that it will supplement the excellent but limited educational work of the Department. It should take a position in this field similar to that occupied by the state societies in tuberculosis and mental hygiene. We also feel a great need of a full time, competent, thoughtful physician to study the program against gonorrhea and syphilis and guide expansion.

Smallpox. — There have been but two cases of smallpox, both in individuals never successfully vaccinated. One was a contact with a case imported into Rhode Island; the origin of infection of the other was not found. Illogically this good record will be used as evidence of the needlessness of continuing compulsory vaccination in the public schools. This very vaccination has made possible a certain indifference to smallpox, which will be cured only by a return of the disease.

Diphtheria. — This year there were 4,750 cases, as compared with 3,401 in 1926. Experience would indicate that this increase will continue for some years. Eight

per cent of the cases die. Toxin-antitoxin is the only hope of preventing this increase but to do this it must be far more extensively used than in the past.

Rabies. — An alarming increase in the prevalence of this disease occurred in the last six months, largely around Metropolitan Boston. Control in this State means elimination of the stray dog. In rural states where this control is practically impossible they are helpless save for the protection afforded by immunization of dogs. In response to the menace 70 cities and towns in the Metropolitan area recently put on a restraint order. Lynn alone has refused, preferring to profit by the protection afforded by its neighbors without itself contributing. There have been 378 persons reported as bitten and taking Pasteur treatment. Undoubtedly many more have been subjected to the discomfort and worry of the fourteen or more injections without being reported. "Only" two people have died, hideously, of rabies, as we are told. Whether the restraint order is effective in control depends entirely upon the extent to which the police pick up the stray dogs, and this in turn depends upon the support they get from the public.

Inoculation of dogs, though not completely effective yet, is giving increasing evidence of its value, and it is recommended to dog owners who desire to contribute toward the protection of their pets, their children and the general public. The time, however, is not yet to advocate universal compulsory inoculation.

Antitoxin and Vaccine Laboratory. — The long needed addition to the laboratory at Forest Hills has at last been made. The original building was put up twenty-three years ago by Harvard University to produce diphtheria antitoxin and small-pox vaccine and to house seven employees. Now there are a dozen products and a staff of about forty, the whole costing less than we would have had to pay for the diphtheria antitoxin alone, if we had purchased it at the "favorable rate" obtained by another state.

This year Harvard University has about doubled the size of the laboratory and stables at an increase in rent very favorable to the State. There is ample chance for expansion in production and the manufacture of new products as they become established. Also there will be opportunity for research and a small number of graduate students, both of which are a great stimulus to any laboratory. Here is an excellent example of cooperative action by a public and private agency to the interests of both and of the general public.

II — NON-COMMUNICABLE DISEASES.

From the defects of infancy and childhood to the degenerative diseases associated with advancing years non-communicable diseases are more and more being forced on the health officer's attention and constitute what the late Dr. Eugene R. Kelley called "the broadening field of preventive medicine."

Cancer: (a) *Hospital.* — On June 21, Governor Alvan T. Fuller spoke at the opening exercises of the Pondville Hospital at Norfolk for treatment of all types and stages of cancer. This institution was originally built some twelve years ago for the treatment of alcoholic and narcotic addicts. During the war it was taken over by the government and had recently been lying idle. It has been entirely renovated, with complete operating facilities, as well as diagnostic and therapeutic X-ray, and a gram of radium. Dr. Robert B. Greenough has been appointed Chief of the Consultative Staff of four, Dr. Ernest M. Daland the Chief of the Visiting Staff of eight, and Dr. Lyman A. Jones the Superintendent. There are ninety beds.

During the fiscal year 125 patients have been admitted. Nineteen have died while sixty-eight have been discharged to their homes. Unfortunately it does not mean that they were cured, but they were sufficiently benefited to leave and will return from time to time for further treatment as indicated. The average stay has been less than a month. This is a third of what was anticipated. The number leaving the hospital benefited, the relative shortness of the stay, the excellence of the staff and adequacy of equipment indicate that a quality of service second to none is being given. If this can be maintained, the service of the institution will be great.

(b) *Clinics.* — Six cancer clinics have been opened, five in cooperation with the local medical profession in Lowell, Lynn, Newton, Springfield and Worcester, and one at the Pondville Hospital. Five others are in process of organization. A local medical committee is responsible for the quality of clinical service, while a

sub-committee of lay men and women handle the educational and publicity work and assist the social worker in her problems. Close cooperation between these clinics and the hospital is being developed so that they may use the Pondville facilities to the best advantage. Of the 1,360 persons seen at the clinics this year (the first opened in December, 1926, and the latest in July, 1927) 23.1% had cancer, and of these 68.8% were classed as "operable." This does not mean "curable" unfortunately but does mean that for two out of every three persons with cancer something definite could be done in the way of benefit or cure.

Nearly two-thirds of the patients came as a result of newspaper publicity. When we realize that for every patient which this publicity sends to the clinic there are from one to three or more (the exact number will never be known) who seek advice from their physician privately, we realize that we are on the road toward saving the 1,200 or more persons dying from cancer in this State annually which our present knowledge, if applied sufficiently early, might save. Thus the program is further extension of readily available skilled diagnostic and therapeutic resources (clinics), and a much more general and early use of them by the public (education), as well as an intelligent follow-up of those found cancerous (social service).

(c) *Education and Studies.* — Education through the spoken and printed word must be extended. We have a central advisory committee headed by Mr. Robert W. Kelso of the Boston Council of Social Agencies. We have nine speakers on call, and much printed material. Regularly material is sent to the newspapers, particularly the small newspapers. Locally the educational committees are doing admirable work and more must be created.

Our studies are based on death records, the Newton Morbidity Reporting Area, the uniform clinic records, extensive data from visiting nursing associations, special social investigations at the Massachusetts General Hospital and Boston Dispensary, and house to house canvasses of selected cities and towns. From these valuable data on the distribution of the disease, available resources, needed extension of service and the like will come. An interesting study on the higher prevalence of the disease among those with foreign born parents as compared with those with native born parents was published.

All this activity seems in the right direction but for permanent success responsible local groups must give both medical and lay service of quality, which can be supplemented and directed centrally. For the State to assume responsibility for actually giving all this varied service while the local community remained passive would spell utter failure.

Child Hygiene. — Here again the State demonstrates and advises in the best methods of obtaining the best service for the child of all ages. We succeed in so far as the local communities adopt and give this service themselves.

(a) *Well Child Conferences.* — These conferences aim to interest the parents in regular health examinations for their children, to promote closer relationships between family and family physician and to show communities how to conduct these conferences themselves. This year they were held in 60 communities, while in eight they were established as a community activity.

(b) *School Hygiene.* — A school physician and school nursing consultant are available to school departments for study of their problems and for advice. Eighteen communities so used this service this year. Also this Department has cooperated with the Department of Education in carrying on state-wide conferences for school physicians, nurses and superintendents, as well as giving summer courses at the Hyannis Normal School for nurses and teachers. This training and improving of personnel is fundamental.

(c) *May Day and Summer Round-Up.* — This is perhaps the most far-reaching activity for child welfare on our program. This year efforts were made to organize a child hygiene committee in every community in the State. Utilizing the interest in children associated with May Day it was the object of this committee to see that every child entering school in the fall should be examined and have physical and hygienic defects corrected to the end that he may enter school "fit to learn". The possibility for future activities by these committees is enormous.

(d) *Dental Hygiene and Nutrition.* — The Department's Dental Policy has the endorsement of the dental profession of the State. Our consultant has constantly

stressed nutrition and the importance of concentrating on the care of the younger children's teeth. Nutritionists have worked with our tuberculosis clinics in the schools and have given summer courses and lectures to teachers and other important groups.

All this is directed at the end of the age scale where a minimum invested in correction gives a maximum in return.

III — THE FLOOD.

In November a series of unusual climatic conditions gave rise to a heavy rainfall producing devastating floods in the Connecticut and Berkshire districts as well as in the states to the north of us. Through the failure of power dams there was much property damage, but the water supply dams all held to the great credit of those responsible. Through the breaking of mains and the flooding of wells and small storage reservoirs there was the menace of faecal pollution. Local health and water authorities were active in repair work, advice as to boiling and prophylactic immunization, etc. The anticipated typhoid increase did not materialize. Neither did the pneumonias due to exposure. Here again local initiative in promptly supplying heated quarters and supplies for those driven from their homes may be credited with a splendid accomplishment.

IV — MILK

A recent study of milk-borne disease in the State shows that the decrease in cases of sickness spread by milk has been more rapid than has the total number of outbreaks so spread. As it is the number of outbreaks rather than cases that indicates the vulnerability of a milk supply we should not feel too sanguine in the matter. While there has apparently been a ten per cent increase in the per capita consumption of milk in the last three years, the figure now being 0.55 quarts, a still further increase of 25% seems desirable from the nutritional standpoint. But is our supply sufficiently safe to warrant health authorities in urging such added consumption?

Under recent legislation the Department promulgated rules and regulations for the licensing of pasteurizing plants, said licenses to be issued by local boards of health. Multiple conferences preceded such promulgation. We sent an inspector to Chicago to study the admirable work being done there in cooperation with the United States Public Health Service in meeting the mechanical difficulties in the way of adequate pasteurization. Following this an inspector has visited 202 plants with local inspectors and has indicated infractions of our rules and regulations. Extensive changes have been made and new equipment purchased by dealers at great expense. But the inspections showed conditions varying from the clean to the filthy. On reinspection certain licenses will inevitably have to be revoked since as always there were a few dealers interested in knowing how little they could do without being closed down. In general it is safe to say that there never was, in all probability, more nearly adequate pasteurization throughout the State than there is today. But only about 60% of our citizens are protected in this way.

What of the safety of the raw milk? This year there has been but one typhoid outbreak traced to it and that producer now pasteurizes. More and more producers are sending in stool and urine specimens from their farm help to detect typhoid carriers but this is still only a negligible fraction of the milk handlers. The Department of Agriculture is active in improving dirty methods of handling. About $\frac{1}{2}$ % of the milk is certified. Two towns over 10,000 have no milk inspector. For every 100,000 quarts sold in cities and towns over 10,000 population there is an average of 30 dairy inspections, 20 bacteriological examinations and 10 chemical examinations. Among the cattle tested for the first time this year by the Division of Animal Industry 26% showed infection with tuberculosis, and over a million people are getting this milk raw.

Now thirty-one cities and towns require that all milk come from non-tuberculous cattle or be pasteurized. This is an increase of eight over last year. At this rate it will take forty years to get all towns into line. We now have a standard ordinance to this effect to recommend. For the third time we are introducing legislation which would in four years extend this protection to all towns except the very smallest, which it seems must be exempted for expediency.

Again we are asked is raw milk in Massachusetts safe? For those producers, dealers, economists and doctors who feel that raw milk has a place in the dietary

of a civilized community today there is an enormous burden of responsibility for having it produced from healthy cattle, under cleanly conditions, and handled with the most scrupulous respect. Unless they assume this burden more effectively in the future than in the past, health authorities will be in an unenviable position in recommending without qualifications a 25 % increase in general milk consumption for nutritional reasons since the calories and vitamins and calcium can be obtained from other and safer foods.

V — SANITATION.

The number of applications from cities, towns and others for advice relative to water supply, drainage and sewage continues to increase and to infringe dangerously on the most important single activity in this field, the supervision of public water supplies. Of necessity we have had to refuse to examine private water supplies except when requested by the local health authorities. Also we have not the resources nor the technique for supervision of such matters as the sanitation of summer camps, rural schools, roadside stands and the like. This year because of the high river flow in August, September and October few complaints have been received relative to nuisances from the various rivers examined.

A rather exhaustive investigation has been made during the past year of cross connections existing at industrial plants between auxiliary sources of water supply and the public supply. This shows that there are many instances where reliance is placed on the proper operation of a gate and check valve to prevent polluted water entering a public supply. Such a condition has been repeatedly proven to be a menace and the Department has notified local water and health authorities, insurance inspection bureaus and industrial plants of the conditions found and has offered to assist in further investigations.

Much time has been spent on the special legislative investigations.

VI — SHELLFISH.

Because of an interpretation of the shellfish statute by the Attorney General's Office which differed radically from that of the previous incumbent in that office there was long delay in issuing certificates, which caused general irritation. Further, much time has been devoted to developing safe methods of supervising the transplanting of shellfish from contaminated to clean areas as an aid to the industry. The method is clumsy. Again, additional areas in Boston Harbor have been found grossly polluted and closed to shellfishing, to the irritation of those affected. Contaminated products have been found in the market and court action taken. A study of methods of purifying soft shelled clams has been made at the request of the Department of Conservation. It would seem that transplanting to clean waters is not practical while chlorination is, if the pollution is not too gross. But application on a large scale may show unforeseen difficulties and supervision of the digging and processing will entail certain probably complex machinery. During all this the Division of Fisheries and Game of the Department of Conservation has done an admirable piece of work in enforcing, so far as a totally inadequate force will permit, the prohibition of digging in contaminated areas.

All this suggests that the industrial, economic, and police aspects of the complex shellfish situation should be under central direction, with this Department advising as to the health aspects of the matter. As it is now we are spending an entirely disproportionate amount of time on aspects of the problem only most remotely connected with health.

VII — RURAL HEALTH ADMINISTRATION.

How can the small town in Massachusetts afford to obtain adequate public health administration? In many rural states county health units are popular, using as standards a population of 20,000, a budget of \$10,000 and a full time personnel composed of a health officer, public health nurse, sanitary inspector and secretary. In Barnstable County a county health board is functioning satisfactorily. But most of our other counties have too large a population.

It might be said that with the field staff of the Department, including district health officers, tuberculosis nurses, and child welfare nurses all functioning in districts, and with our engineers and food inspectors we should be able to sufficiently supplement limited local effort to give adequate results. But when it is realized that there are 283 towns with less than 10,000 population each, the amount of time that the above mentioned staff can give to an individual town is very limited.

Add this to the local staff, largely part time, of nurses, agents, physicians, and inspectors and it is no wonder that confusion rather than a clear health program results. So the question of adequate public health service to this population group still remains unanswered.

VIII — PERSONNEL.

The organization of the Public Health Council has not changed during the past year, the Governor having reappointed Dr. Lee and Dr. Lally at the expiration of their terms.

The Department was fortunate in having Dr. Sumner H. Remick accept reinstatement as Director of the Division of Tuberculosis (Sanatoria) in April. Dr. Henry D. Chadwick, who had been Acting Director in addition to his other duties since Dr. Remick's resignation, is devoting his attention to his work as Superintendent of the Westfield State Sanatorium and Chief of the Tuberculosis Clinics.

Dr. George T. O'Donnell, State District Health Officer of the Eastern District, resigned in June, and Dr. Edward A. Lane, who had been Acting District Health Officer, was given this district.

On May first Dr. Lyman Asa Jones, District Health Officer in the Northeastern Health District, accepted appointment as Superintendent of the Pondville Hospital, and Dr. George M. Sullivan, who had been connected with the Tuberculosis Clinics, was transferred to this district.

Mr. Merton P. Young, Assistant Director of the Division of Administration, resigned on September first to accept an appointment with another State department.

Dr. Chester S. Stirrett was appointed as Veterinary Food Inspector in June and has devoted his entire time to the inspection of pasteurization plants, as authorized by Chapter 259 of the Acts of 1927.

The expansion of the work of the Antitoxin and Vaccine Laboratory with the erection of the new building has made additions to the staff necessary. Dr. James A. McComb was appointed in June, vice Dr. Gerald F. O'Malley, resigned, and in addition four new positions (bacteriologist, janitor, laborer and stableman) have been created.

ORGANIZATION.

The organization of the Department is as follows:

Commissioner of Public Health	George H. Bigelow, M.D.
Public Health Council	6

Division of Administration:

Secretary (1), Statistical Consultant (1), Clerks and Stenographers (11).	13
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(Cancer Section):

Epidemiologists (2), Social Worker (1), Clerks and Stenographers (5).	8
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Division of Biologic Laboratories:

Benjamin White, Director.

Assistant Director (1), Chemists and Bacteriologists (6), Laboratory Assistants (5), Laboratory Helpers (7), Stable Foreman (1), Stablemen and Laborers (14), Janitor (1), Clerks and Stenographers (3).

(Wassermann Laboratory):

Chief of Laboratory (1), Bacteriologists (2), Laboratory Helpers (4), Clerks and Stenographers (3).	49
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Division of Communicable Diseases:

Clarence L. Scamman, M.D., Director and Deputy Commissioner.

District Health Officers (6), Epidemiologist (1), Clerks and Stenographers (5).

(Diagnostic Laboratory):

Bacteriologists (4), Laboratory Assistant (1), Laboratory Helpers (5), Clerks and Stenographers (1)

(Venereal Disease):

Special Investigator (1), Social Worker (1), Lecturer (1), Clerks and Stenographers (2)	29
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Division of Food and Drugs:

Hermann C. Lythgoe, Director.

Chemists (6), Veterinary Inspectors (3), Food Inspectors (5), Laboratory Assistant (1), Laborers (2), Clerks and Stenographers (6).

P.D. 34.	11
Division of Hygiene:	
Merrill E. Champion, M.D., Director.	
Dental Hygienist (1), Nutritionists (4), Educational Workers (2), Child Welfare Physician (1), Clerks and Stenographers (7).	
(Maternal and Infant Hygiene):	
Child Welfare Physician (1), Nursing Supervisors (4), Clerks and Stenographers (4).	25
Division of Sanitary Engineering:	
X. H. Goodnough, Chief Sanitary Engineer.	
Engineers and Engineering Assistants (16), Clerks and Stenographers (10).	27
Division of Tuberculosis:	
Sumner H. Remick, Director.	
Assistant Director (1), Field Nurses (5), Superintendent of Sanatoria Construction (1), Examiner of Settlements and Support Claims (1), Clerks and Stenographers (6).	
(Tuberculosis Clinics):	
Child Welfare Physicians (5), Nurses (3), Clerks and Stenographers (7), Chauffeur (1).	31
Division of Water and Sewage Laboratories:	
Harry W. Clark, Director.	
Chief of Laboratory (1), Chemists and Bacteriologists (8), Laboratory Assistants (2), Mechanical Handyman and Laborers (3), Clerks and Stenographers (2).	17
Total	223

IX — PUBLICATIONS.

The following articles have been published by members of the staff:

Division of Administration.

Profession of Nursing
 Dr. George H. Bigelow
 Boston Medical and Surgical Journal 196:355-357 March 3, 1927

Cancer Problem in Massachusetts
 Dr. George H. Bigelow
 Boston Medical and Surgical Journal, 196:684-685 April 28, 1927

The Flood in Massachusetts
 Dr. George H. Bigelow
 American Journal of Public Health, Vol. XVII, No. 12 December, 1927

The State Cancer Hospital
 Dr. George H. Bigelow
 The Massachusetts Elephant, Vol. 4, No. 10

Cancer Section.

The Care of Chronic Cancer Patients in Massachusetts
 Dr. Mary R. Lakeman
 Hospital Social Work, Vol. 15, p. 473

Cancer Studies in Massachusetts. 1. The Relationship between Cancer and Density of Population in Massachusetts
 Dr. Herbert L. Lombard and Dr. Carl R. Doering
 Proceedings of the National Academy of Science, Vol. 13, No. 10, October, 1927

Investigation of Cases of Unidentified Illness in Haverhill, Mass.
 Dr. Lyman A. Jones and Dr. Herbert L. Lombard
 Boston Medical and Surgical Journal, Vol. 197, No. 1, pp. 19-21, July 7, 1927

Scarlet Fever Outbreak Due to Infected Food
 Dr. Clarence L. Scamman, Dr. Herbert L. Lombard, Edith A. Beckler, S.B., and George M. Lawson
 American Journal of Public Health, Vol. XVII, No. 4, April, 1927

The Opening of the Pondville Cancer Hospital at Norfolk, Mass.
 Opening Address, His Excellency Alvan T. Fuller, Gov. of Massachusetts
 Cancer and the Medical Profession, John M. Birnie, M.D.
 Cancer and the Public, Robert W. Kelso
 National Aspects of the Cancer Problem, George A. Soper, Ph.D.
 Cancer Clinics, William T. Hopkins, M.D.
 Cancer and the Public Dependents, John H. Nichols, M.D.
 The Service of the Pondville Hospital at Norfolk, Robert B. Greenough, M.D.
 Boston Medical and Surgical Journal, Vol. 197, No. 14, October 6, 1927,
 pp. 551-561

Whats and Whys of Cancer

Dr. Herbert L. Lombard

The Boston Medical and Surgical Journal, Vol. 196, No. 23, June 9, 1927,
 pp. 968-970

Division of Biologic Laboratories — Antitoxin and Vaccine Laboratory.

An Anti-Measles-Diplococcus Serum, Ruth Tunnicliff and Benjamin White
 Boston Medical and Surgical Journal, Vol. 197, No. 7, pp. 272-273, August 18,
 1927

Wassermann Laboratory.

A Glycerol-Cholesterol Precipitation Reaction in Syphilis, William A. Hinton
 Boston Medical and Surgical Journal, Vol. 196, No. 24, pp. 993-996, June 16,
 1927

Division of Communicable Diseases.

Contagious Diseases: The Variety of Administrative Methods for their Control,
 Clarence L. Scamman, M.D.

Boston Medical and Surgical Journal, Vol. 196, pp. 232-4, February 10, 1927

Diphtheria Immunization in Providence, Clarence L. Scamman, M.D. and A. S.
 Pope, M.D.

Journal of the American Medical Association, Vol. 88, pp. 563-565, February
 19, 1927

Scarlet Fever Outbreak Due to Infected Food, Clarence L. Scamman, M.D., and
 others

American Journal of Public Health, Vol. 17, pp. 311-316, April, 1927

To Increase Effectiveness, Edward A. Lane, M.D.

Public Health Nurse, November, 1927

A Brief Statement as to the Method of Deriving the Prosodemic and Epidemic
 Indices, Filip C. Forsbeck, M.D., and others

Boston Medical and Surgical Journal, Vol. 197, pp. 283-284, August 18, 1927

Milk Borne Disease in Massachusetts, Filip C. Forsbeck, M.D., and George H.
 Bigelow, M.D.

American Journal of Public Health, October, 1927

Division of Food and Drugs.

Water, The Universal Adulterant, Hermann C. Lythgoe

The Nucleus, March, 1927

The Ammonia Content of Cold Storage Eggs, Hermann C. Lythgoe

Industrial and Engineering Chemistry, p. 922, August, 1927

Division of Water and Sewage Laboratories.

An Outline of Sewage Purification Studies at the Lawrence Experiment Station
 Harry W. Clark

Industrial and Engineering Chemistry, Vol. 19, No. 4, p. 448, April, 1927

The Effect of Pipes of Different Metals upon the Quality of Water Supplies

Harry W. Clark

Journal of the New England Water Works Association, Vol. XLI, No. 1, p. 31,
 March, 1927

Iron as a Carrier of Oxygen in Sewage Purification, Harry W. Clark

Engineering News-Record, Vol. 98, No. 14, p. 578, April 7, 1927

Submerged Contact Aerators in Sewage Purification, Harry W. Clark
Engineering News-Record, Vol. 98, No. 14, p. 578, April 7, 1927

Division of Tuberculosis.

Sanatorium Treatment of Extra Pulmonary Tuberculosis, Dr. Leon A. Alley,
Supt. Lakeville State Sanatorium

Boston Medical and Surgical Journal, Tuberculosis Section, June 7, 1927

Tuberculous Diaphysis, Dr. Harold Ragolsky, Asst. Supt. Lakeville State Sanatorium

Journal of Bone and Joint Surgery

Observations in the Underweight Clinics in Massachusetts, Dr. Henry D. Chadwick
and Dr. David Zacks

Journal of the American Medical Association, August, 1927

Tuberculosis Case Finding in Children, Dr. Henry D. Chadwick

American Review of Tuberculosis, May, 1927

The Tuberculosis Situation in Massachusetts, Dr. Henry D. Chadwick

Boston Medical and Surgical Journal, September, 1927

Incidence of Contagious Diseases in Sanatoria, Dr. E. C. Willoughby, Asst. Supt.,
North Reading State Sanatorium

Boston Medical and Surgical Journal, September, 1927

Treatment of Pulmonary Tuberculosis, Dr. E. B. Emerson, Supt. Rutland State
Sanatorium

Boston Medical and Surgical Journal, September, 1927

Division of Hygiene.

Maternal and Infant Hygiene Activities in Massachusetts, Susan M. Coffin, M.D.

Women's Medical Journal, November, 1927

Breast Feeding Campaign in Fall River, Helen M. Hackett, R.N.

Boston Medical and Surgical Journal, September 22, 1927

The Crack in the Dam, Eleanor B. Gallinger, S.B.

Good Health, February, 1927

X — NEW LEGISLATION.

The Department is asking for important milk legislation and authority for health officers to examine on suspicion any food handler to determine if he can spread communicable disease as a case or as a carrier.

We recommend legislation which would protect the people of the State from bovine tuberculosis. It requires that eventually, by 1931, all milk sold should be either pasteurized or from non-tuberculous cattle, except in towns of less than 5,000 population, where it is optional. This does not mean that in these small towns there is no menace. Quite the contrary. Nor does it mean that their health is of less importance. But it does mean that the small town has been the principal rallying point of the opposition, and the exemption is, therefore, expedient rather than rational.

The last Legislature passed bills requiring licensing of pasteurizing plants which is increasing the effectiveness of this important proceeding, regarding the control of the sale of tuberculin, and "the area testing" of cattle. This year we understand that bills will be introduced for increased remuneration to the farmer for condemned cattle and for some form of quarantine to keep infected animals out of tuberculosis "clean" areas. This bill fits in admirably with the general aims of all these bills, which are to increase the safety of our most important single food product and to increase the health of the cattle, which means the profit of the farmer.

Bovine tuberculosis is an important factor in the non-pulmonary forms of the disease in man. Milk from infected cattle has been repeatedly found infected. The less adequate the supervision of the milk supply the higher the proportion of infected children. Twenty-four cities and towns in the State now have such local regulations. About 60 per cent of the population are protected against tuberculosis from milk. But varying regulations in adjoining communities are a hardship on

the producer. Uniformity is needed, as is protection for the other 40 per cent of our people, particularly the heavy milk consumers, the children.

This bill is extremely moderate and even in 1931 would not protect the entire State as New York and New Jersey will protect in 1928.

We also recommend legislation which would require any food handler, without cost to himself and in the presence of his own physician if he so desires, to submit on suspicion of the State or local health officer to an examination to determine whether he is suffering from a communicable disease or is a "carrier" of such disease. It is generally recognized that persons suffering with such diseases as open pulmonary tuberculosis, measles, leprosy, and dysentery should not come in contact with food to be consumed by others. The bakery law recognizes this (Section 45, Chapter 111, General Laws) by allowing examination on suspicion of disease. But there are many points in the handling of food far more menacing than the bakery.

It is not so generally recognized that the well person carrying the germs of diseases such as typhoid fever and diphtheria may be fully as much, if not more, of a menace than the person sick with the disease. Since they are "well" they will continue indefinitely at work and will not attract attention as would the sick person. Yet many investigations of disease outbreaks have been completely frustrated by the unwillingness of certain food handlers to submit to examination of blood, stool, urine, sputum or throat cultures. The records of the Department show twice as many persons suspected of being typhoid "carriers" but refusing examination as were actually proven to be "carriers." Many of the "suspects" would undoubtedly have been found not to be "carriers." But some through their refusal were not recognized and continue as a menace to handle food. The Montreal typhoid of last summer menaces Massachusetts through the hundreds of carriers produced. In the course of time many will come to us, some as food handlers. Health officers must have authority to recognize them on reasonable suspicion.

This bill gives no authority for handling the recognized "carrier" as was requested in the rejected typhoid carrier legislation of last year. Fourteen states have such legislation but here we apparently prefer to depend on the sometimes fragile reed of cooperation. But this bill gives the first step in effective control, which is recognition of the sick individual or the carrier of a disease that may be spread by handling food.

FINANCIAL STATEMENT.

Appropriations and Expenditures for the Year ended November 30, 1927.

	Appropriations.	Expended.
Division of Administration	\$37,400.00	\$35,843.79
Division of Hygiene	44,180.00	43,692.54
Maternal and Infant Hygiene	28,780.00	26,735.48
Division of Communicable Diseases	71,250.00	70,029.73
Venereal Diseases	28,820.00	24,213.63
Manufacture and Distribution Arspenamine	14,460.00	11,961.82
Division of Food and Drugs	55,400.00	52,146.66
Division of Biologic Laboratories:		
Antitoxin and Vaccine Laboratory	84,855.00	84,730.30
Wassermann Laboratory	17,900.00	17,559.57
Division of Tuberculosis	42,420.00	41,478.86
Subsidies to Cities and Towns	222,000.00	220,403.86
Tuberculosis Clinic Units	53,200.00	50,417.27
Division of Sanitary Engineering	76,700.00	73,666.90
Division of Water and Sewage Laboratories	43,700.00	43,008.33
Cancer Clinics	45,000.00	32,355.29
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	\$866,065.00	\$828,244.03

Special Appropriations and Expenditures for Year ended November 30, 1927.

	Appropriation.	Expended.
Antitoxin and Vaccine Equipment — New Bldg.	\$29,500.00	\$29,483.19
Shellfish Information, Ch. 33 — Res. 1927	2,000.00	1,898.43
Merrimack Valley Water Supply Investigation, Ch. 30 — Res. 1927	12,000.00	7,853.53
Salem, Beverly, Peabody and Danvers Water Supply Investigation, Ch. 30 — Res. 1927	1,000.00	834.10
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	\$44,500.00	\$40,069.25

GEORGE H. BIGELOW, M.D.,
Commissioner of Public Health.

REPORT OF THE DIVISION OF SANITARY ENGINEERING.

X. H. GOODNOUGH, *Director and Chief Engineer.*

OVERSIGHT AND CARE OF INLAND WATERS.

Water Supply and Sewerage.

During the year 1927 there was a further increase in the number of applications for the approval of plans for systems of water supply, drainage and sewerage and for the advice of the Department relative thereto. The total number of such applications and petitions received during the year aggregated 436 as compared with 322 in the previous year, an increase of 35 per cent. Of the total number of applications received, 336 related to water supply, 5 to sources of ice supply, 38 to sewage and sewage disposal, 10 to pollution of streams, and 47 to miscellaneous matters.

A new water supply was introduced during the year into the town of Somerset, making the total number of cities and towns supplied with water from public works 220 out of the total of 355 cities and towns in the State.

The rainfall for the year 1927 amounted to 46.94 inches or 2.40 inches in excess of the normal as determined from observations at eight stations in different parts of the State having rainfall records for more than 50 years. The distribution of the rainfall was most remarkable in that there was a deficiency of 6.86 inches in the first six months of the year, January to June inclusive, and an excess of rainfall amounting to 9.26 inches in the remaining months, excepting in the month of September in which the rainfall was about normal.

On November 3 and 4 a great rain storm passed across New England causing excessive floods in Vermont and western Massachusetts and in the southeastern part of Massachusetts and adjacent sections of Rhode Island and Connecticut. A great loss of life was caused by the freshets in Vermont and one life was lost in Becket, Mass., due to the failure of a dam on a reservoir on one of the tributaries of the West Branch of the Westfield River. Large property damage was caused in the sections visited by the storm.

The total rainfall during the year 1927 on the watershed of Wachusett Reservoir, which is located approximately in the center of the State, was 54.67 inches, which is 9.31 inches above the normal. For the first six months in the year the rainfall was 16.99 inches, or 5.38 inches less than the normal, and for the last six months the total was 37.68 inches, or 14.69 inches in excess of the normal. The rainfall was very greatly in excess of the normal in all of the last six months of the year with the exception of September, which had slightly less than the normal. The average yield of the watershed during the year was 1,389,000 gallons per square mile per day, which was about 298,000 gallons per day in excess of the normal, or about 27 per cent. The average flow for the last six months in the year was about 1,609,000 gallons per square mile per day, which was 983,000 gallons per day or nearly 157 per cent in excess of the average in those months. In consequence of the deficiency of rainfall in the three preceding years the reservoir had been drawn down in the early part of 1927 to a level about 32 feet below high water. The excessive rains of the latter half of the year raised the level of the water in the reservoir by the end of the year to a point about 10 feet below high water. Owing to the danger of shortage of water indicated by the low rainfall in the early part of the year, works were constructed for utilizing the water of the upper reservoirs in the Sudbury River watershed, known as the Ashland, Hopkinton and Whitehall reservoirs, as a temporary water supply for the Metropolitan District. These works permit the diversion of the waters of Hopkinton and Whitehall reservoirs into the Sudbury Reservoir, and the water of Ashland Reservoir into the Sudbury aqueduct, so that these waters which are less objectionable than other portions of the Sudbury River watershed may be drawn upon for emergency use. A large quantity of water was also used during the year from Lake Cochituate. On account of the pollution of this lake the water was treated with chlorine before being supplied to the district. Because of these conditions the quality of the water supplied to the Metropolitan District during the year

has been less satisfactory than for many years, a condition which very probably may continue until the additional supplies from the Ware and Swift rivers have been made available by the construction of the works already authorized.

Metropolitan Water Supply.

Under the legislation of 1926 a commission known as the Special Metropolitan District Water Supply Commission was created by Chapter 375 of the Acts of that year and directed to construct a tunnel to the Ware River at Coldbrook Springs and to acquire property and water rights in the valley of the Swift River for the further extension of the system which is to include the Ware and Swift rivers. In 1927 under the provisions of Chapter 321 of the Acts of that year the Special Metropolitan District Water Supply Commission was authorized and directed to extend the works for the Metropolitan water supply to the Swift River and to take from the latter stream all of its flow excepting the amount necessary to maintain a flow of 20 million gallons per day in the mill pond at Bondsville in the town of Palmer about seven miles below the dam of the proposed reservoir on the Swift River. It was also provided that no water should be taken from the Millers River under the provisions of that act. The act thus modifies the recommendations of the Joint Board on which the legislation of 1926 was based in that it provides for a much larger taking of the flow of water from the Swift River than was recommended by the Joint Board of 1922 and excludes for the present, at least, the taking of water from the Millers River. Work was begun early in 1927 upon the construction of a tunnel from Wachusett Reservoir to the Ware River at Coldbrook and also on acquiring property in the valley of the Swift River at the site of the proposed new storage reservoir.

SANITARY PROTECTION OF PUBLIC WATER SUPPLIES.

Rules and regulations were established during the year for the protection of the water supply of Scituate.

The cities, towns and districts for which rules and regulations have been established for the sanitary protection of their water supplies up to the end of the year are the following:

Abington and Rockland	Greenfield	North Andover
Adams	Haverhill	Northborough
Amherst	Hingham and Hull	Norwood
Andover	Holden	Peabody
Ashburnham	Holyoke	Pittsfield
Ashfield	Hudson	Plymouth
Attleboro	Lakeville (State Sanatorium)	Randolph and Holbrook
Braintree	Lee	Rockport
Brockton and Whitman	Leicester (Cherry Valley and Rochdale)	Russell
Cambridge	Leominster	Rutland
Chester	Lincoln and Concord	Salem and Beverly
Chicopee	Lynn	Scituate
Cohasset	Marlborough	Springfield
Concord	Maynard	Springfield and Ludlow
Dalton	Medfield (State Hospital)	Stockbridge
Danvers and Middleton	Metropolitan Water District	Taunton
Easthampton	Milford	Wakefield
Fall River	Montague	Westfield
Falmouth	Newburyport	West Springfield
Fitchburg	Norfolk (State Hospital)	Weymouth
Gardner	Northampton	Williamsburg
Great Barrington		Winchester
(Housatonic)		Worcester

Connection of Auxiliary Fire Supplies with Public Water Supply Systems.

It is the general practice in manufacturing establishments throughout the State to provide connections with auxiliary sources of water supply from which water may be drawn by pumps of large capacity for fire or industrial use. The pipes of many of these supplies are in general connected directly with the public

water supply system with check valves so arranged as to close when the pressure in the auxiliary supply becomes greater than that in the public water supply system. In addition to the check valves positive gates are usually installed in the neighborhood of the check valves. The emergency water supply is usually drawn from the nearest available body of water regardless of its sanitary quality, and in case of any failure in the operation of the check valves water from the emergency supply may enter the pipes of the public water supply system.

Recognizing the danger from the possible failure of operation of the check valves, it has been the custom in recent years to introduce two check valves on the auxiliary water supply pipe for fire purposes near the connection with the public supply. These double check valves are placed generally in a chamber so arranged as to be subject to inspection for possible leakage, and such connections are usually also further protected by a gate valve so that the connection may be shut off entirely when necessary. There are also many cases where an auxiliary supply is used for supplying boilers or for other purposes in the establishment which may also be connected with the public supply, making possible the entrance of water from the auxiliary system into the public water supply mains. Furthermore, there are sometimes connections from both the public and the auxiliary supplies into vats, tanks, etc., from which there is sometimes danger that water of the latter supplies may be siphoned into the public system. The general results of these investigations to the end of the year showed the following conditions:

Number of plants inspected to date.	799
Number of plants where no cross connections exist	162
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Number of plants where cross connections were found	637
Of this total,	
379 plants had fire service cross connections	
258 plants had mill service cross connections	
Number of plants having both fire service and mill service cross connections .	493
Of the total of 379 plants having fire service cross connections	
137 plants had double check valve protection	
212 plants had single check valve protection	
8 plants had gate valve protection only	
14 plants had fire service meters only	
8 plants where the existence of any protection is not definitely known	
were found.	

It will be noted that many of the auxiliary or secondary supplies are connected with the public system with a single check valve as the only means of protection, and the investigation shows that these valves are in many cases deeply covered in the ground and inaccessible except by digging up the pipe. Furthermore, there are many of these which have not been inspected for many years. The connection of an auxiliary or secondary supply with public water works systems is objectionable in any case, though frequent and regular inspections would reduce greatly any danger therefrom. The existence of single check valves which cannot be readily inspected is unquestionably a menace to the public health and should be removed.

Following the examinations made during the past year all of the cities and towns in which objectionable connections exist were notified of the conditions found, as were also the proprietors of establishments involved and the insurance inspection bureaus interested.

EXAMINATION OF PUBLIC WATER SUPPLIES.

Inspections have been made of many of the sources of water supply during the year and the condition of the waters in nearly all of them has been determined by analysis. The number of microscopical and bacterial examinations has been increased considerably over previous years, especially those pertaining to the condition of the Metropolitan auxiliary supplies which it has been necessary to use for the Metropolitan water supply. The average yearly results of chemical analyses of water from the various sources examined during the year 1927 are given in the following table:

Analyses of the Water of Public Water Supplies.
Averages of Chemical Analyses of Surface-Water Sources for the Year 1927.
 [Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus-pended.		
Metropolitan Water District	Wachusett Reservoir, upper end	.36	4.43	.0031	.0163	.0029	.26	1.2
	Wachusett Reservoir, lower end	.11	3.78	.0019	.0116	.0019	.26	1.2
	Sudbury Reservoir	.14	4.09	.0019	.0133	.0022	.30	1.5
	Framingham Reservoir No. 3	.14	4.23	.0019	.0136	.0029	.32	1.6
	Hopkinton Reservoir	.41	4.60	.0022	.0143	.0012	.38	1.3
	Ashland Reservoir	.49	4.70	.0021	.0159	.0021	.39	1.3
	Framingham Reservoir No. 2	.61	6.23	.0062	.0191	.0028	.64	1.8
	Lake Cochituate	.16	7.49	.0027	.0174	.0036	.82	3.0
	Chestnut Hill Reservoir	.13	4.36	.0015	.0116	.0014	.34	1.7
	Weston Reservoir	.12	4.23	.0017	.0125	.0017	.32	1.6
	Spot Pond	.06	4.05	.0015	.0127	.0019	.31	1.6
	Tap in State House	.12	4.13	.0013	.0115	.0016	.33	1.7
	Tap in Revere	.05	3.98	.0011	.0116	.0019	.31	1.6
	Tap in Quincy	.11	4.29	.0009	.0102	.0011	.37	1.9
Abington.	Big Sandy Pond	.05	3.69	.0052	.0125	.0015	.68	0.8
Adams (Fire District)	Dry Brook	.23	7.06	.0012	.0110	.0015	.10	4.6
	Bassett Brook	.01	4.74	.0009	.0048	.0007	.11	3.2
Amherst	Amethyst Brook large reservoir.	.51	4.04	.0015	.0125	.0014	.13	0.9
	Amethyst Brook small reservoir.	.19	3.49	.0022	.0099	.0017	.16	1.2
Andover	Haggett's Pond	.12	4.64	.0019	.0148	.0013	.40	1.8
Ashburnham	Upper Naukeag Lake.	.10	2.71	.0017	.0074	.0010	.16	0.6
Ashfield	Bear Swamp Brook	.25	4.87	.0017	.0106	.0018	.11	2.7
Athol	Phillipston Reservoir	.68	4.98	.0050	.0272	.0093	.19	1.4
	Buckman Brook Reservoir	.25	3.77	.0028	.0250	.0110	.13	0.9
	Thousand Acre Meadow Brook.	1.43	5.68	.0042	.0258	.0036	.14	1.4
	Inlet of filter	.43	3.99	.0075	.0189	.0037	.16	1.3
	Outlet of filter	.30	3.87	.0040	.0144	.0026	.16	1.2
Barre	Reservoir	.10	3.60	.0015	.0098	.0011	.16	1.4
Blandford (Fire District)	Freeland Brook	.01	3.60	.0024	.0031	.0005	.20	1.2
BROCKTON	Silver Lake	.07	4.01	.0015	.0132	.0023	.57	0.9
Brookfield	Cooley Hill Reservoir.	.14	4.02	.0017	.0113	.0015	.19	1.1
CAMBRIDGE	Lower Hobbs Brook Reservoir.	.14	5.74	.0032	.0213	.0036	.45	2.4
	Upper Hobbs Brook Reservoir.	.35	5.94	.0036	.0232	.0031	.43	2.3
	Stony Brook Reservoir	.48	7.24	.0031	.0189	.0020	.57	2.6
	Fresh Pond	.08	8.41	.0110	.0203	.0035	.71	4.2
Cheshire	Thunder Brook	.05	5.00	.0037	.0059	.0009	.08	3.4
	Kitchen Brook	.03	5.10	.0029	.0047	.0013	.09	3.1
Chester (Fire District)	Austin Brook Reservoir	.11	3.68	.0011	.0085	.0006	.12	1.6
	Horn Pond	.20	3.92	.0017	.0127	.0015	.13	1.8
CHICOPEE	Morton Brook	.05	5.12	.0039	.0054	.0014	.27	1.5
	Cooley Brook	.71	5.52	.0075	.0176	.0030	.19	1.7
Clinton	Tap in town.	.19	4.06	.0010	.0115	.0018	.20	1.4
Colrain (Griswoldville).	McClellan Reservoir	.09	6.87	.0025	.0104	.0021	.17	4.6
Colrain (Fire District No. 1)	Mountain Brook Reservoir	.03	8.37	.0005	.0036	.0007	.13	5.5
Concord	Nagop Pond	.05	3.63	.0026	.0112	.0014	.37	1.4
Dalton (Fire District)	Egypt Brook Reservoir	.17	3.17	.0018	.0102	.0015	.10	1.3
	Windsor Reservoir	.44	5.00	.0033	.0163	.0019	.12	2.5
	Cady Brook.	.22	4.64	.0022	.0103	.0014	.11	2.3
Danvers	Middleton Pond.	.29	5.05	.0036	.0176	.0020	.41	1.7
	Swan Pond	.19	5.04	.0058	.0199	.0040	.38	2.0
Deerfield (South Deerfield Water Supply District)	Roaring Brook	.04	6.71	.0010	.0061	.0004	.13	3.9
Egremont (South)	Goodale Brook	.05	4.15	.0005	.0025	.0005	.11	5.3
FALL RIVER	North Watuppa Lake.	.08	4.00	.0030	.0130	.0018	.50	1.1
Falmouth	Long Pond	.06	4.17	.0014	.0095	.0014	1.03	0.8
FITCHBURG	Meetinghouse Pond	.07	3.22	.0061	.0157	.0032	.20	1.0
	Scott Reservoir	.12	3.29	.0048	.0146	.0029	.20	1.0
	Wachusett Lake	.07	2.75	.0051	.0130	.0019	.19	1.0
	Fahulah Brook	.14	3.16	.0022	.0113	.0021	.16	0.8
	Ashby Reservoir.	.22	3.34	.0063	.0202	.0044	.17	0.7
GARDNER.	Crystal Lake	.04	4.93	.0022	.0128	.0020	.29	2.1
GLOUCESTER	Dike's Brook Reservoir	.34	4.60	.0058	.0119	.0016	.84	0.8
	Wallace Reservoir	.44	4.95	.0025	.0197	.0052	.98	0.9
	Haskell Brook Reservoir	.10	4.28	.0020	.0094	.0013	.81	0.8
Great Barrington (Fire District)	East Mountain Reservoir	.15	5.85	.0020	.0084	.0011	.11	3.6
Great Barrington (Housatonic)	Long Pond	.02	8.52	.0044	.0192	.0040	.13	7.5
Greenfield	Glen Brook Upper Reservoir	.03	6.31	.0010	.0050	.0006	.17	3.4
	Glen Brook Lower Reservoir	.04	6.14	.0016	.0072	.0010	.17	3.4
Hadley (Water Supply District)	Hart's Brook Reservoir	.09	4.65	.0007	.0059	.0009	.16	2.4
Hatfield	Running Gutter Brook Reservoir	.11	6.82	.0010	.0041	.0007	.20	2.7
HAVERHILL	Johnson's Pond	.12	5.32	.0026	.0172	.0021	.43	2.5

Averages of Chemical Analyses of Surface-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus- pended.		
HAVERHILL (cont.)	Crystal Lake	.12	3.88	.0019	.0154	.0017	.32	1.4
	Kenoza Lake	.14	5.57	.0029	.0152	.0017	.42	2.3
	Lake Saltonstall	.07	7.10	.0067	.0197	.0035	.61	3.3
	Pentucket Lake	.12	4.70	.0019	.0163	.0025	.38	1.9
	Millvale Reservoir	.66	6.45	.0035	.0210	.0018	.40	2.2
Hingham.	Accord Pond	.14	4.16	.0033	.0131	.0019	.65	0.8
	Fulling Mill Pond	.58	6.01	.0200	.0236	.0054	.68	1.8
Hinsdale (Fire District)	Reservoir	.10	2.37	.0005	.0068	.0013	.09	0.8
HOLYOKE.	Whiting Street Reservoir	.07	5.77	.0039	.0146	.0021	.27	3.2
	Fomer Reservoir	.30	4.07	.0032	.0161	.0030	.16	1.3
	Wright and Ashley Pond	.08	5.34	.0027	.0157	.0024	.18	2.9
	High Service Reservoir	.09	4.35	.0027	.0188	.0030	.18	1.9
	White Reservoir	.16	3.82	.0035	.0178	.0032	.15	1.6
Hudson	Gates Pond	.07	3.66	.0041	.0154	.0017	.24	1.5
Huntington (Fire Dis- trict)	Cold Brook Reservoir.	.13	3.76	.0010	.0063	.0005	.13	1.2
	Dow's Brook Reservoir	.35	6.44	.0051	.0183	.0028	.66	2.3
Ipswich	Merrimack River, filtered	.39	5.67	.0059	.0102	—	.58	2.1
	Codding Brook Upper Reservoir	.10	3.59	.0012	.0075	.0007	.10	1.8
LAWRENCE	Codding Brook Lower Reservoir	.12	3.67	.0014	.0068	.0008	.10	1.9
	Basin Pond Brook	.57	3.92	.0028	.0144	.0017	.08	1.3
	Reservoir	.04	7.82	.0003	.0043	.0003	.09	6.3
	Laurel Lake	.10	14.08	.0069	.0217	.0037	.22	16.4
	Morse Reservoir	.14	2.93	.0037	.0110	.0010	.16	0.5
LEOMINSTER	Haynes Reservoir	.12	3.20	.0081	.0174	.0028	.18	0.5
	Fall Brook Reservoir	.10	3.17	.0039	.0121	.0020	.18	0.7
	Sandy Pond	.03	3.30	.0022	.0107	.0017	.29	1.0
	Cooley Brook	.07	5.39	.0097	.0143	.0058	.25	2.9
	Birch Reservoir	.11	5.38	.0073	.0136	.0023	.71	2.0
Lincoln	Breed's Reservoir	.28	6.28	.0064	.0179	.0027	.70	2.5
	Walden Reservoir	.54	7.09	.0070	.0207	.0030	.74	2.8
	Hawkes Reservoir	.61	7.86	.0074	.0264	.0038	.87	3.5
	Gravel Pond	.04	4.33	.0028	.0128	.0018	.78	1.3
	Lake Williams	.07	6.13	.0063	.0204	.0037	.75	2.5
LYNN	Millham Brook Reservoir	.50	5.56	.0060	.0191	.0027	.42	1.9
	White Pond	.09	3.38	.0009	.0103	.0028	.24	1.3
	Charles River, filtered	.27	5.27	.0009	.0082	—	.29	2.2
	Lake Pleasant	.02	3.35	.0031	.0059	.0007	.14	1.0
	Wannacomet Pond	.08	7.86	.0032	.0217	.0075	2.73	2.0
NEW BEDFORD	Little Quittacas Pond.	.23	4.15	.0019	.0162	.0024	.50	1.1
	Great Quittacas Pond	.43	4.31	.0019	.0176	.0024	.50	1.1
	Artichoke River	.37	7.20	.0113	.0365	.0098	.60	2.4
	Notch Brook Reservoir	.03	7.24	.0024	.0054	.0014	.08	5.8
	Broad Brook	.15	4.03	.0045	.0094	.0011	.08	2.0
NORTHAMPTON	Mount Williams Reservoir	.01	6.36	.0019	.0070	.0012	.08	5.1
	Middle Reservoir	.25	4.85	.0036	.0117	.0015	.15	1.7
	Mountain Street Reservoir	.08	4.26	.0013	.0077	.0008	.13	1.9
	Great Pond	.10	4.98	.0031	.0151	.0014	.43	2.1
	Lower Reservoir	.78	4.76	.0052	.0233	.0050	.26	1.2
North Andover	Upper Reservoir	.75	4.98	.0057	.0217	.0030	.27	1.3
	Doane Pond.	.42	3.91	.0076	.0228	.0035	.20	1.1
	North Pond.	.44	4.13	.0078	.0239	.0038	.21	1.3
	Reservoir	.22	4.15	.0008	.0067	.0013	.12	1.1
	Buckmaster Pond	.09	4.73	.0077	.0188	.0058	.43	1.6
Orange	Reservoir	.03	3.62	.0006	.0021	.0002	.13	1.1
	Lower Reservoir	.20	4.32	.0024	.0139	.0017	.20	1.3
	Spring Pond.	.17	6.11	.0094	.0177	.0036	.80	2.4
	Suntaug Lake	.47	6.33	.0076	.0217	.0036	.78	2.2
	Ashley Lake.	.12	6.09	.0201	.0126	.0020	.10	4.2
PRITTSFIELD	Ashley Brook	.14	6.53	.0047	.0104	.0017	.11	4.7
	Hathaway Brook.	.07	7.95	.0009	.0061	.0010	.11	6.9
	Mill Brook	.35	4.27	.0028	.0166	.0021	.11	1.8
	Sacket Brook	.11	7.30	.0016	.0086	.0019	.13	5.9
	Farnham Reservoir	.53	4.32	.0057	.0213	.0030	.11	1.7
Plymouth	Little South Pond	.02	3.05	.0027	.0151	.0022	.65	0.3
	Great South Pond	.01	2.94	.0033	.0132	.0015	.64	0.3
	Great Pond	.45	5.24	.0034	.0170	.0011	.72	1.5
	Cape Pond	.24	9.64	.0016	.0195	.0043	3.22	2.1
	Black Brook.	.18	3.96	.0014	.0124	.0025	.13	1.4
Rutland	Muschopauge Lake	.06	3.81	.0013	.0115	.0022	.37	1.6
SALEM	Wenham Lake	.43	8.21	.0084	.0214	.0031	.92	3.0
	Longham Reservoir	1.31	8.06	.0131	.0358	.0065	.98	2.3
	Ipswich River at pumping sta- tion	.88	10.82	.0080	.0268	.0070	.80	5.0
	Fox Brook	.05	6.53	.0005	.0040	.0001	.11	3.2
	Hatchet Brook Reservoir No. 3.	.20	3.21	.0030	.0130	.0016	.19	0.8
Shelburne (Shelburne Falls Fire District)	Hatchet Brook Reservoir No. 4.	.21	3.31	.0042	.0151	.0031	.19	0.8
Southbridge								

Averages of Chemical Analyses of Surface-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus- pended.		
South Hadley (Fire Dis- trict No. 1)	Leaping Well Reservoir	.06	3.46	.0025	.0124	.0034	.17	1.1
	Buttery Brook Reservoir	.18	5.01	.0041	.0090	.0022	.34	1.5
Spencer	Shaw Pond	.03	3.01	.0027	.0141	.0025	.20	1.2
SPRINGFIELD	Westfield Little River, filtered	.14	4.15	.0008	.0062	-	.13	1.3
Stockbridge	Lake Averie	.09	7.55	.0017	.0117	.0017	.13	5.1
Stoughton	Muddy Pond Brook	.19	4.15	.0009	.0087	.0006	.34	1.0
TAUNTON.	Assawompsett Pond	.26	4.04	.0034	.0176	.0028	.48	1.0
	Elder's Pond	.09	3.71	.0024	.0153	.0018	.49	0.9
Wakefield	Crystal Lake	.13	6.95	.0059	.0156	.0021	.92	2.9
Wareham (Onset)	Jonathan Pond	.00	2.97	.0012	.0109	.0008	.63	0.5
Wayland	Snake Brook Reservoir	.84	5.47	.0041	.0180	.0029	.32	1.7
WESTFIELD	Montgomery Reservoir	.41	3.27	.0054	.0144	.0025	.13	0.6
	Tillotson Brook Reservoir	.11	3.64	.0020	.0077	.0015	.14	0.8
West Springfield	Bear Hole Brook	.11	7.75	.0028	.0075	.0009	.18	4.4
	Bear Hole Brook, filtered	.05	7.92	.0017	.0040	-	.18	4.8
West Stockbridge	East Mountain Reservoir	.03	5.50	.0001	.0035	.0012	.13	3.1
Weymouth	Great Pond	.55	4.16	.0012	.0162	.0038	.48	0.9
Williamsburg	Reservoir	.13	5.02	.0011	.0077	.0025	.11	2.2
Williamstown	Rattlesnake Brook	.01	8.22	.0003	.0037	.0015	.06	7.4
	Paul Brook	.01	4.58	.0015	.0042	.0007	.09	3.1
Winchester	North Reservoir	.03	4.53	.0031	.0133	.0023	.41	1.9
	South Reservoir	.03	3.81	.0021	.0108	.0018	.37	1.6
	Middle Reservoir	.10	3.98	.0044	.0225	.0065	.38	1.7
WORCESTER	Bottomly Reservoir	.61	5.71	.0031	.0259	.0068	.22	2.1
	Kent Reservoir	.13	4.12	.0019	.0126	.0024	.21	1.6
	Leicester Reservoir	.17	4.14	.0032	.0151	.0026	.22	1.4
	Mann Reservoir	.11	3.91	.0024	.0129	.0023	.22	1.5
	Upper Holden Reservoir	.14	3.52	.0020	.0137	.0035	.20	1.0
	Lower Holden Reservoir	.14	3.50	.0018	.0133	.0030	.19	1.0
	Kendall Reservoir	.19	3.66	.0032	.0144	.0020	.19	1.2
	Pine Hill Reservoir	.42	4.24	.0132	.0203	.0038	.24	1.4

Averages of Chemical Analyses of Ground-Water Sources for the Year 1927.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS—		Hardness.	Iron.
				Free.	Albu- minoid.		Nitrates.	Nitrites.		
Acton (West and South Water Supply District)	Tubular wells	.00	8.77	.0004	.0015	.41	.0990	.0000	3.6	.007
Adams (Fire District)	Tubular wells	.00	12.85	.0000	.0011	.16	.0385	.0000	16.0	.004
Amesbury	Tubular wells	.18	15.92	.0101	.0041	.50	.0070	.0000	8.0	.473
	Tubular wells, filtered	.00	14.66	.0028	.0030	.49	.0048	.0000	7.9	.008
Ashland	Tubular wells, new supply	.00	6.38	.0011	.0028	.44	.0070	.0001	2.6	.007
ATTLEBORO.	Wells	.00	5.48	.0008	.0034	.44	.0125	.0000	2.3	.007
Auburn	Tubular wells	.00	7.50	.0009	.0013	.50	.1725	.0001	3.7	.008
Avon	Wells	.00	6.58	.0003	.0015	.59	.1780	.0000	2.7	.008
Ayer	Large well	.00	7.73	.0006	.0017	.66	.0767	.0000	3.3	.017
	Tubular wells	.06	7.30	.0009	.0021	.33	.0094	.0000	3.1	.044
Barnstable	Tubular wells	.01	4.67	.0013	.0019	1.10	.0053	.0001	1.5	.011
Bedford	Large well	.00	4.22	.0003	.0018	.33	.0075	.0000	1.7	.005
Billerica	Wells	.21	10.75	.0010	.0065	.44	.0176	.0000	4.6	.043
Blackstone	Tap (supply from Woonsocket, R. I.)	.42	8.37	.0009	.0087	.65	.0337	.0000	3.7	.027
Braintree	Filter-gallery	.02	14.76	.0013	.0066	1.58	.4708	.0001	5.1	.012
Bridgewater	Wells	.00	6.12	.0017	.0012	.65	.0617	.0000	1.9	.007
Brookline	Tubular wells and filter-gallery, filtered	.06	9.72	.0005	.0057	.73	.0237	.0000	4.4	.008
Canton.	Springdale well	.10	5.75	.0012	.0037	.46	.0277	.0000	2.1	.010
	Well near Henry's Spring	.15	5.62	.0015	.0050	.56	.0482	.0000	2.3	.015
	Ward well	.01	6.55	.0007	.0047	.47	.0072	.0000	2.5	.009
Chelmsford (North Chelmsford Fire District)	Tubular wells	.10	6.53	.0144	.0086	.50	.0633	.0003	2.3	.024

Averages of Chemical Analyses of Ground-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS—		Hardness.	Iron.
				Free.	Albu- minoid.		Nitrates.	Nitrites.		
Chelmsford (Water District)	Tubular wells	.00	7.94	.0004	.0017	.56	.0828	.0013	3.2	.022
Cohasset	Tubular wells	.08	13.49	.0008	.0073	1.83	.1577	.0000	6.2	.007
	Dug well, filtered.	.21	7.17	.0054	.0115	1.02	.0110	.0001	2.4	.022
Cummington	Tubular wells	.10	6.07	.0017	.0022	.10	.0043	.0000	3.8	.038
Dedham	Large well and tubular wells	.05	9.98	.0020	.0043	.95	.1180	.0000	4.6	.009
Deerfield (Fire District)	Wells	.00	5.50	.0007	.0014	.13	.0035	.0000	2.8	.006
Douglas	Tubular wells	.00	5.25	.0002	.0010	.35	.0640	.0000	2.0	.010
Dracut (Water Supply District)	Tubular wells	.04	12.33	.0012	.0022	.73	.1957	.0001	6.0	.028
Dracut (Collinsville)	Tubular wells	.12	5.65	.0010	.0073	.45	.0282	.0000	2.1	.023
Dudley	Tubular wells	.01	4.37	.0013	.0021	.25	.0060	.0001	1.3	.007
Dunstable	Well	.00	5.00	.0005	.0021	.24	.0033	.0000	2.1	.006
Duxbury (Fire and Water District)	Tubular wells	.00	4.30	.0001	.0009	.79	.0073	.0000	1.2	.005
East Brookfield	Tubular wells	.00	4.37	.0001	.0017	.24	.0267	.0000	1.4	.009
Easthampton	Tubular wells	.00	7.13	.0001	.0012	.15	.0250	.0000	4.0	.005
Easton (North Easton Village District)	Well	.02	6.05	.0013	.0025	.52	.0940	.0003	2.6	.014
Edgartown	Large well	.00	4.37	.0006	.0012	.94	.0040	.0000	0.8	.005
Fairhaven	Old wells	.32	8.20	.0023	.0087	1.07	.0694	.0000	3.2	.010
	New wells	.00	6.40	.0000	.0034	.96	.0730	.0002	2.0	.031
Foxborough (Water Supply District)	Tubular wells	.00	5.55	.0003	.0010	.42	.0570	.0000	1.8	.006
Framingham	Filter-gallery	.00	17.42	.0017	.0062	1.41	.0813	.0000	8.3	.068
Franklin	Tubular wells	.00	6.07	.0001	.0017	.55	.0237	.0000	2.2	.006
Grafton	Filter-gallery	.07	13.55	.0003	.0043	1.55	.2675	.0000	5.5	.012
Granville	Well	.00	3.80	.0005	.0013	.12	.0037	.0000	1.5	.005
Great Barrington	Well near Green River.	.01	8.79	.0011	.0050	.12	—	—	7.9	.007
	Filter-gallery near Green River	.12	5.37	.0022	.0079	.13	—	—	3.2	.009
Greenfield	Well near Green River.	.01	5.25	.0002	.0025	.13	.0027	.0000	3.6	.011
Groton.	Large well	.00	6.33	.0012	.0025	.23	.0040	.0000	3.3	.006
Groton (West Groton Water Supply District)	Tubular wells	.04	5.48	.0006	.0014	.21	.0132	.0001	3.3	.024
Hingham	Wells	.17	5.98	.0021	.0067	.65	.0136	.0001	2.0	.012
Holliston	Large well	.39	4.97	.0034	.0150	.33	.0053	.0000	1.6	.030
Hopkinton	Tubular wells	.00	8.74	.0006	.0017	.58	.1380	.0000	3.7	.012
Kingston	Tubular wells	.00	5.00	.0005	.0012	.66	.0040	.0000	1.4	.011
Leicester (Water Supply District)	Wells	.19	6.07	.0009	.0043	.25	.0600	.0000	2.1	.015
Leicester (Cherry Valley and Rochdale Water District)	Wells	.23	5.77	.0033	.0115	.37	.0063	.0000	2.3	.014
Littleton	Tubular wells	.00	4.30	.0003	.0013	.25	.0233	.0000	1.8	.007
LOWELL	Boulevard wells (tubular)	.77	7.52	.0449	.0067	.51	.0224	.0002	2.8	.342
	Boulevard wells, filtered.	.05	6.74	.0006	.0038	.54	.0368	.0000	2.8	.020
Manchester.	Wells	.01	10.77	.0006	.0020	1.69	.1063	.0000	4.2	.020
Mansfield (Water Supply District)	Large well	.00	4.20	.0005	.0012	.29	.0222	.0000	1.6	.010
Marblehead.	Inlet of filter	.18	18.32	.0078	.0056	1.73	.0082	.0002	9.9	.131
	Outlet of filter	.03	19.75	.0004	.0059	1.45	.0078	.0000	12.8	.010
	Well	.04	22.19	.0003	.0039	3.16	.0161	.0000	13.0	.014
Marion.	Tubular wells	.00	4.57	.0001	.0014	.71	.0412	.0000	1.8	.005
Marshfield	Tubular wells at Humarock Beach	.00	7.55	.0004	.0010	2.01	.0410	.0000	2.2	.006
	New wells at Brant Rock	.00	10.00	.0000	.0008	2.54	.0250	.0000	2.3	.003
Mattapoisett	Tubular wells	.00	6.17	.0005	.0012	.93	.0540	.0000	2.8	.008
Medfield	Spring	.01	4.50	.0015	.0043	.30	.0130	.0000	1.6	.010
Medway	Wells	.00	8.03	.0048	.0029	.77	.0472	.0001	3.2	.013
Merrimac	Tubular wells	.00	9.19	.0006	.0014	.48	.0314	.0000	3.7	.014
Methuen	Tubular wells at Harris Brook	.54	7.06	.0048	.0145	.47	.0151	.0000	2.7	.068
	Tubular wells at Pine Island	.03	9.89	.0014	.0030	.73	.1306	.0006	5.9	.031
Middleborough (Fire District)	Well	.28	7.13	.0124	.0050	.61	.0445	.0001	2.8	.334
	Filtered water	.06	6.28	.0008	.0029	.62	.0462	.0003	2.4	.022
Millbury	Well	.01	5.70	.0007	.0033	.36	.0210	.0000	2.1	.008
Millis	Spring	.00	12.95	.0009	.0018	.91	.3067	.0000	5.9	.009
Monson	Large well	.07	3.88	.0002	.0031	.18	.0070	.0000	1.2	.006

Averages of Chemical Analyses of Ground-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS—		Hardness.	Iron.
				Free.	Albu- minoid.		Nitrates.	Nitrites.		
Monterey	Springs . . . . .	.05	8.60	.0003	.0031	.10	—	—	7.3	.014
Nantucket	Wells at Wyers Valley . . . . .	.00	5.40	.0001	.0011	1.79	.0040	.0000	1.6	.007
Natick	Large well . . . . .	.00	10.90	.0004	.0015	1.01	.0445	.0000	5.5	.006
Needham	Wells . . . . .	.00	8.20	.0001	.0017	.77	.2217	.0000	3.3	.008
	Hicks Spring . . . . .	.00	11.75	.0001	.0021	1.05	.4983	.0000	4.1	.006
NEWBURYPORT	Wells and Artichoke River, filtered . . . . .	.11	6.48	.0013	.0096	.60	.0169	.0000	2.6	.019
NEWTON	Tubular wells and filter-gallery . . . . .	.06	8.74	.0032	.0043	.63	.0374	.0000	4.1	.019
North Attleborough	Wells . . . . .	.02	6.72	.0010	.0019	.55	.0320	.0000	3.0	.016
Northbridge	Tubular wells . . . . .	.01	3.87	.0004	.0018	.28	.0127	.0000	1.3	.009
Norton	Tubular wells . . . . .	.02	5.07	.0001	.0010	.31	.0053	.0000	1.7	.020
Norwood	Tubular wells . . . . .	.11	9.47	.0034	.0044	.63	.0513	.0001	4.1	.101
Oak Bluffs	Springs . . . . .	.00	4.30	.0001	.0019	.91	.0123	.0001	1.0	.010
Oxford	Tubular wells . . . . .	.00	5.57	.0002	.0011	.33	.0470	.0000	2.3	.006
Palmer (Bondsville)	Tubular wells . . . . .	.00	6.63	.0003	.0013	.26	.0353	.0000	2.3	.040
Pepperell	Tubular wells . . . . .	.00	4.53	.0009	.0015	.18	.0097	.0000	1.4	.007
Provincetown	Tubular wells . . . . .	.01	7.67	.0004	.0025	2.37	.0047	.0000	1.2	.015
Reading	Filter-gallery . . . . .	.87	9.78	.0170	.0242	1.53	.0125	.0000	3.1	.237
	Filtered water . . . . .	.19	12.70	.0097	.0094	1.54	.0050	.0000	5.8	.028
Salisbury	Old well . . . . .	.16	8.07	.0017	.0053	.54	.0044	.0000	3.5	.015
	New well . . . . .	.19	9.38	.0009	.0021	.53	.0039	.0000	5.0	.047
Scituate	Tubular wells . . . . .	.00	13.84	.0010	.0018	2.30	.1880	.0000	4.8	.006
Sharon	Well . . . . .	.00	18.85	.0005	.0028	3.06	.3900	.0000	8.4	.005
	Tubular wells . . . . .	.00	6.70	.0006	.0019	.55	.0492	.0000	2.3	.006
Sheffield	Spring . . . . .	.00	4.37	.0003	.0014	.10	.0040	.0000	1.8	.006
Shirley (Shirley Village Water District)	Well . . . . .	.00	5.15	.0004	.0013	.40	.1425	.0000	1.4	.007
Shrewsbury	Tubular wells . . . . .	.04	6.20	.0005	.0043	.47	.0490	.0000	2.4	.008
South Hadley (Fire District No. 2)	Large well . . . . .	.00	4.93	.0001	.0013	.16	.0163	.0000	1.9	.007
Sunderland	Springs . . . . .	.01	6.60	.0005	.0022	.14	.0036	.0000	3.9	.011
Tisbury	Well . . . . .	.00	3.70	.0000	.0004	1.00	.0040	.0000	1.0	.003
Uxbridge	Tubular wells . . . . .	.00	5.50	.0007	.0019	.45	.0683	.0000	2.2	.012
Walpole	Tubular wells . . . . .	.01	5.73	.0004	.0015	.41	.0493	.0000	2.2	.018
WALTHAM	Old well . . . . .	.16	9.71	.0051	.0035	.78	.0154	.0000	4.5	.160
	New well . . . . .	.00	7.32	.0007	.0036	.56	.0177	.0000	3.5	.007
Ware	Wells . . . . .	.00	8.10	.0005	.0016	.51	.1560	.0000	3.2	.008
	Large well . . . . .	.00	7.19	.0004	.0017	.45	.1340	.0000	2.8	.006
Wareham (Fire District)	Tubular wells . . . . .	.00	4.53	.0003	.0011	.57	.0040	.0000	1.0	.009
Warren	Tubular wells . . . . .	.00	3.90	.0005	.0011	.24	.0222	.0000	1.4	.005
Wayland	Wells . . . . .	.03	7.87	.0006	.0015	.43	.1167	.0026	3.6	.020
Webster	Wells . . . . .	.01	4.27	.0015	.0023	.36	.0193	.0000	2.0	.012
Wellesley	Tubular wells . . . . .	.01	10.30	.0007	.0024	1.11	.0687	.0000	4.9	.014
	Well at Williams Spring . . . . .	.05	10.65	.0010	.0073	1.44	.0540	.0000	4.5	.010
	Filter-gallery . . . . .	.01	10.60	.0009	.0031	1.16	.1002	.0000	4.9	.008
Westborough	Filter basin . . . . .	.01	3.62	.0014	.0089	.27	—	—	1.4	.007
West Brookfield	Tubular wells . . . . .	.00	4.43	.0005	.0017	.23	.0080	.0000	1.5	.008
Westford	Tubular wells . . . . .	.20	5.57	.0013	.0021	.25	.0040	.0001	2.3	.167
Weston	Well at Warren Ave. . . . .	.21	7.47	.0011	.0071	.53	.0232	.0000	3.7	.013
	Tubular wells at Kendal Green . . . . .	.00	7.60	.0006	.0012	.80	.0715	.0000	3.5	.005
West Stockbridge	Johnson's Spring . . . . .	.00	9.85	.0003	.0013	.09	.0050	.0000	8.1	.029
Williamstown	Cold Spring . . . . .	.01	12.23	.0011	.0034	.07	—	—	14.5	.010
	Sherman Spring . . . . .	.00	9.83	.0003	.0016	.07	—	—	8.4	.006
Winchendon	Old wells . . . . .	.10	4.02	.0009	.0046	.13	.0050	.0000	1.6	.018
	New wells . . . . .	.42	4.52	.0015	.0086	.12	.0072	.0000	1.5	.011
WOBBURN	Filter-gallery . . . . .	.02	10.45	.0016	.0071	1.23	.0157	.0002	5.0	.007
Worthington (Fire District)	Springs . . . . .	.00	4.40	.0007	.0012	.11	.0043	.0000	2.3	.006
Wrentham	Tubular wells . . . . .	.00	4.90	.0007	.0013	.32	.0177	.0000	1.5	.007

CONSUMPTION OF WATER.

The quantity of water consumed in the various cities and towns of the State, so far as ascertainable during the year 1927, is presented in the following table. In this table the estimated population is based on the increase which took place in the cities and towns included in the table in the years 1920 to 1925. The apparently excessive consumption in many of the cities and towns is due usually either to the use of large quantities of water for manufacturing processes or to the fact that the town is a summer resort and is occupied by a large temporary population in the summer season, as, for example, the towns of Scituate, Nahant, Cohasset, etc.

The remarkably low per capita consumptions shown in the table, as, for example, in Acushnet, Agawam, Dartmouth, etc., are due to the fact that only a portion of the towns is as yet supplied with water from the public works, while the per capita consumption is based on the entire population of the town.

Average Daily Consumption of Water in Various Cities and Towns in 1927.

CITY OR TOWN.	Esti- mated Popu- lation.	Gallons.	Gallons per Inhabit- ant.	CITY OR TOWN.	Esti- mated Popu- lation.	Gallons.	Gallons per Inhabit- ant.
Metropolitan Water District	1,341,486	132,489,000	99	Greenfield . . .	15,246	1,497,000	98
Arlington . . .	27,455	1,528,000	56	Groton . . .	2,525	221,000	88
Belmont . . .	17,058	938,000	55	Groveland . . .	2,485	37,000	15
Boston . . .	792,244	92,751,000	117	Hanson and Pem- broke . . .	3,797	226,000	60
CHELSEA . . .	48,873	3,441,000	70	HAVERHILL . . .	49,232	4,421,000	90
EVERETT . . .	42,854	4,909,000	114	Holliston . . .	2,854	103,000	36
Lexington . . .	8,359	520,000	63	HOLYOKE . . .	60,388	7,384,000	122
MALDEN . . .	52,863	3,419,000	65	Hudson . . .	8,339	419,000	50
MEDFORD . . .	51,063	2,878,000	56	Ipswich . . .	6,055	262,000	43
MELROSE . . .	20,949	1,343,000	64	Kingston . . .	2,532	232,000	92
Milton . . .	14,253	703,000	49	Lancaster . . .	2,765	97,000	35
Nahant . . .	1,754	171,000	97	LAWRENCE . . .	93,527	5,090,000	54
QUINCY . . .	64,927	5,001,000	77	Lincoln . . .	1,412	243,000	172
REVERE . . .	35,037	2,377,000	68	Littleton . . .	1,465	54,000	37
SOMERVILLE . . .	101,408	7,946,000	78	Longmeadow . . .	3,619	195,000	54
Stoneham . . .	9,568	498,000	52	LOWELL . . .	110,296	5,671,000	51
Swampscott . . .	9,293	688,000	74	Ludlow . . .	9,335	193,000	21
Watertown . . .	27,090	2,257,000	83	LYNN . . .	104,654	8,207,000	78
Winthrop . . .	16,440	1,111,000	68	Lynnfield . . .	1,397	18,000	13
Abington and Rock- land . . .	14,055	545,000	39	Manchester . . .	2,512	292,000	116
Acton . . .	2,477	101,000	41	Mansfield . . .	6,724	486,000	72
Acushnet . . .	4,559	76,000	17	Marblehead . . .	8,570	665,000	78
Adams . . .	13,748	1,333,000	97	Marion . . .	1,271	118,000	93
Agawam . . .	6,797	107,000	16	MARLBOROUGH . . .	16,719	659,000	39
Amesbury . . .	11,706	690,000	59	Mattapoisett . . .	1,668	99,000	59
Amherst . . .	6,141	594,000	97	Maynard . . .	8,165	292,000	36
Andover . . .	11,100	824,000	74	Medford . . .	3,976	71,000	18
Ashburnham . . .	2,218	124,000	56	Medway . . .	3,220	196,000	61
Ashland . . .	2,615	215,000	82	Merrimac . . .	2,419	125,000	52
Athol . . .	9,602	687,000	72	Methuen . . .	22,772	1,188,000	52
ATTLEBORO . . .	20,980	1,084,000	52	Middleborough . . .	9,410	271,000	29
AVON . . .	2,434	110,000	45	Milford . . .	18,626	834,000	45
Ayer . . .	3,032	185,000	61	Millbury . . .	6,757	296,000	44
Barnstable . . .	6,149	278,000	45	Millis . . .	1,913	131,000	68
Bedford . . .	1,575	71,000	45	Nantague . . .	9,442	817,000	87
BEVERLY . . .	22,735	1,406,000	62	Nantucket . . .	3,294	352,000	107
Billerica . . .	5,420	300,000	55	Natick . . .	13,657	728,000	53
Braintree . . .	14,238	1,048,000	74	Needham . . .	9,763	620,000	64
Bridgewater . . .	9,880	315,000	32	NEW BEDFORD . . .	119,539	8,767,000	73
BROCKTON . . .	65,343	2,984,000	46	NEWBURYPORT . . .	15,672	1,377,000	88
Brookline . . .	44,654	4,238,000	95	NEWTON . . .	55,783	4,416,000	79
CAMBRIDGE . . .	123,659	12,045,000	97	NORTH ADAMS . . .	22,891	1,081,000	48
Canton . . .	5,896	457,000	78	North Andover . . .	7,069	475,000	67
Chelmsford . . .	6,929	162,000	23	North Attleborough . . .	10,010	664,000	66
CHICOPEE . . .	44,149	2,812,000	64	Northbridge . . .	10,051	653,000	65
Clinton . . .	14,660	829,000	57	North Brookfield . . .	3,220	300,000	93
Cohasset . . .	3,023	276,000	92	Norton . . .	2,927	134,000	46
Concord . . .	7,294	609,000	83	Norwood . . .	14,761	1,173,000	79
Danvers and Middle- ton . . .	13,930	1,264,000	91	Oak Bluffs . . .	1,420	173,000	122
Dartmouth . . .	10,039	122,000	12	Orange . . .	5,141	168,000	33
Dedham . . .	15,168	852,000	56	PEABODY . . .	19,998	3,077,000	154
Dracut . . .	6,848	127,000	19	Pepperell . . .	2,903	149,000	51
Dudley . . .	4,951	163,000	33	PITTSFIELD . . .	48,923	6,211,000	127
Duxbury . . .	1,742	160,000	92	Plainville . . .	1,570	125,000	80
East Bridgewater . . .	3,559	171,000	48	Plymouth . . .	13,228	1,500,000	113
East Brookfield . . .	948	34,000	36	Provincetown . . .	3,787	275,000	73
Easthampton . . .	11,717	835,000	71	Randolph and Hol- brook . . .	9,317	517,000	55
East Longmeadow . . .	3,447	55,000	16	Reading . . .	9,195	326,000	35
Easton . . .	5,450	234,000	43	Rockport . . .	3,977	261,000	66
Edgartown . . .	1,253	110,000	89	Rutland . . .	2,434	260,000	107
Fairhaven . . .	12,241	437,000	36	SALEM . . .	42,937	5,134,000	120
FALL RIVER . . .	132,396	6,768,000	51	Salisbury . . .	1,868	198,000	106
Falmouth . . .	5,172	572,000	111	Saugus . . .	13,491	720,000	53
FITCHBURG . . .	44,641	4,011,000	90	Scituate . . .	2,785	587,000	211
Foxborough . . .	5,253	468,000	89	Sharon . . .	3,379	236,000	70
Framingham . . .	22,696	1,400,000	62	Shirley . . .	2,448	58,000	24
Franklin . . .	7,278	493,000	68	Shrewsbury . . .	6,663	232,000	35
GARDNER . . .	20,489	818,000	42	Southbridge . . .	15,987	752,000	47
GLOUCESTER . . .	25,546	1,756,000	75	SPRINGFIELD . . .	147,405	14,145,000	96
Grafton . . .	7,007	112,000	16	Stockbridge . . .	1,856	212,000	114
Great Barrington . . .	6,441	564,000	88	Stoughton . . .	8,253	566,000	69
				TAUNTON . . .	40,103	3,230,000	81

Average Daily Consumption of Water in Various Cities and Towns in 1927.
— Concluded.

CITY OR TOWN.	Estimated Population.	Gallons.	Gallons per Inhabitant.	CITY OR TOWN.	Estimated Population.	Gallons.	Gallons per Inhabitant.
Tisbury	1,493	195,000	131	West Brookfield	1,328	53,000	40
Uxbridge	6,488	393,000	61	WESTFIELD	19,638	1,863,000	95
Wakefield	16,645	742,000	45	Westford	3,731	153,000	41
Walpole	6,932	833,000	120	Weston	3,156	175,000	55
WALTHAM	36,278	2,180,000	60	West Springfield	16,080	2,277,000	142
Ware	8,671	354,000	41	Weymouth	18,131	1,121,000	62
Wareham	6,066	203,000	33	Whitman	8,141	292,000	36
Warren	4,144	58,000	14	Winchester	11,997	997,000	83
Webster	13,441	688,000	51	WOBURN	19,088	1,672,000	88
Wellesley	10,179	791,000	78	WORCESTER	195,159	15,254,000	78
West Bridgewater	3,207	132,000	41	Wrentham	3,376	107,000	32

RAINFALL.

The following table shows the normal rainfall in the State, the rainfall as deduced from eight stations with long-term records, the rainfall for the year 1927, and the excess or deficiency of precipitation in each month as compared with the normal.

MONTH.	Normal Rainfall (Inches).	Rainfall in 1927 (Inches).	Excess or Deficiency in 1927 (Inches).	MONTH.	Normal Rainfall (Inches).	Rainfall in 1927 (Inches).	Excess or Deficiency in 1927 (Inches).
January	3.78	2.78	-1.00	July	3.76	4.19	+0.43
February	3.63	3.24	-0.39	August	4.19	7.82	+3.63
March	3.93	1.50	-2.43	September	3.44	3.37	-0.07
April	3.65	1.77	-1.88	October	3.68	4.65	+0.97
May	3.58	3.06	-0.52	November	3.91	6.57	+2.66
June	3.28	2.64	-0.64	December	3.71	5.35	+1.64
Totals					44.54	46.94	+2.40

FLOW OF STREAMS.

Sudbury River.

The average yield of the Sudbury River in the year 1927 was 1,411,000 gallons per day per square mile of drainage area. The normal flow of this river for the 53 years during which records have been maintained is 977,000 gallons per square mile per day. The average daily yield for the six driest months, April to September, inclusive, was 676,000 gallons per square mile, or 74.2 per cent above the normal.

The following table shows the relation between the average daily yield of the Sudbury River per square mile in each month in the year 1927 and the normal yield of the river during the past 53 years. The drainage area of the river at the point of measurement is 75.2 square miles.

Table showing the Average Daily Yield of the Sudbury River for Each Month in the Year 1927, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1927		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.733	1.120	2.006	1.297	+ .273	+ .177
February	2.399	1.551	2.261	1.462	- .138	- .089
March	4.177	2.700	3.178	2.054	- .999	- .646
April	3.042	1.967	1.071	.692	-1.971	-1.275
May	1.693	1.094	1.188	.768	- .505	- .326
June . . . . .	.769	.497	.332	.215	- .437	- .282
July . . . . .	.307	.198	.201	.130	- .106	- .068
August . . . . .	.354	.229	1.464	.946	+1.110	+ .717
September . . . . .	.372	.241	2.023	1.307	+1.651	+1.066
October . . . . .	.602	.389	2.006	1.297	+1.404	+ .908
November	1.208	.783	6.229	4.026	+5.021	+3.243
December	1.542	.997	4.277	2.764	+2.735	+1.767
Average for whole year	1.512	.977	2.183	1.411	+ .671	+ .434

The rainfall on the Sudbury River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1922 to 1927, inclusive, together with the average for a period of fifty-three years, are given in the following table:

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area.

MONTH.	1922.			1923.			1924.			1925.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	1.89	.577	30.5	7.64	2.779	36.4	3.60	3.205	89.1	4.47	.328	7.4
February	3.25	1.316	40.5	2.31	1.507	65.3	2.56	1.193	46.7	2.20	2.985	136.0
March	5.35	4.587	85.7	3.25	5.659	173.9	2.66	3.462	130.0	5.69	3.895	68.4
April	1.63	3.371	207.1	5.35	4.197	78.4	5.49	5.268	96.1	2.95	2.570	87.2
May	5.39	3.126	58.0	1.01	2.099	207.3	3.22	2.495	77.6	2.45	1.036	42.2
June	8.90	2.695	30.3	4.12	0.668	16.2	1.49	.485	32.5	4.75	.374	7.9
July	3.21	1.287	40.1	2.94	0.118	4.0	3.19	-0.094	-2.9	5.35	.427	8.0
August	4.85	.627	12.9	2.17	-0.130	-6.0	4.73	0.207	4.4	1.25	.102	8.2
September	4.09	1.135	27.7	1.54	-0.099	-6.5	5.67	0.706	12.4	3.19	.068	2.1
October	2.28	.486	21.3	5.71	0.707	12.4	0.11	0.011	10.0	4.41	.626	14.2
November	1.34	.639	47.8	5.83	1.969	33.8	2.51	0.286	11.4	3.17	1.001	31.6
December	3.42	.730	21.4	4.96	3.921	79.1	1.73	0.489	28.4	5.76	3.330	57.8
Totals and averages	45.60	20.576	45.1	46.83	23.395	50.0	36.96	17.713	47.9	45.64	16.742	36.7

MONTH.	1926.			1927.			MEAN FOR FIFTY-THREE YEARS, 1875-1927.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	3.00	1.539	51.2	2.91	2.313	79.5	3.98	1.999	50.2
February	5.92	1.596	27.0	3.71	2.355	63.5	4.06	2.520	62.1
March	3.23	4.863	150.6	1.43	3.664	256.6	4.22	4.818	114.2
April	2.21	3.323	150.5	2.24	1.194	53.3	3.58	3.396	94.9
May	2.29	1.284	56.1	2.97	1.369	46.1	3.26	1.953	60.0
June	1.60	.179	11.2	1.99	.370	18.6	3.24	.858	26.5
July	3.18	—122	—3.8	3.82	.232	6.1	3.70	.354	9.6
August	5.51	.415	7.5	8.92	1.688	18.9	3.85	.408	10.6
September	1.40	—196	—14.0	3.82	2.260	59.3	3.37	.415	12.3
October	3.77	.203	5.4	5.10	2.313	45.3	3.61	.693	19.2
November	5.27	1.386	26.3	8.21	6.950	84.6	3.90	1.351	34.7
December	4.03	1.195	29.7	5.61	4.931	87.8	3.82	1.778	46.6
Totals and averages	41.41	15.665	37.8	50.73	29.639	58.4	44.59	20.543	46.1

The following table gives the record of the yield of the Sudbury River watershed in gallons per day per square mile for each of the past six years and the mean for the past fifty-three years:

Yield of the Sudbury River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1922.	1923.	1924.	1925.	1926.	1927.	Mean for Fifty-three Years, 1875-1927.
January	323,000	1,558,000	1,796,000	184,000	863,000	1,297,000	1,120,000
February	817,000	935,000	715,000	1,852,000	991,000	1,462,000	1,551,000
March	2,571,000	3,172,000	1,941,000	2,183,000	2,726,000	2,054,000	2,700,000
April	1,956,000	2,435,000	3,056,000	1,491,000	1,927,000	692,000	1,967,000
May	1,753,000	1,177,000	1,399,000	581,000	720,000	768,000	1,094,000
June	1,561,000	387,000	281,000	217,000	104,000	215,000	497,000
July	722,000	67,000	—52,000	239,000	—68,000	130,000	198,000
August	351,000	—73,000	116,000	57,000	233,000	946,000	229,000
September	657,000	—57,000	408,000	39,000	—113,000	1,307,000	241,000
October	272,000	397,000	6,000	351,000	114,000	1,297,000	389,000
November	370,000	1,140,000	166,000	580,000	803,000	4,026,000	783,000
December	409,000	2,198,000	274,000	1,867,000	670,000	2,764,000	997,000
Average for whole year	980,000	1,114,000	841,000	797,000	746,000	1,411,000	977,000
Average for driest six months	463,000	307,000	152,000	247,000	167,000	676,000	388,000

¹ The drainage area of the Sudbury River used in making up these records included water surfaces amounting to about 2 per cent of the whole area from 1875 to 1878, inclusive, subsequently increasing by the construction of storage reservoirs to about 3 per cent in 1879, to 3.5 per cent in 1885, to 4 per cent in 1894, and to 6.5 per cent in 1898. The drainage area also contains extensive areas of swampy land, which, though covered with water at times, are not included in the above percentages of water surfaces.

Nashua River.

The average yield of the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton during the year 1927 was 1,389,000 gallons per day per square mile of drainage area, or about 27 per cent in excess of the average for the past 31 years.

The average yield for the six driest months, April to September, inclusive, was 949,000 gallons per square mile per day, or 70.1 per cent above the normal.

The following table shows the normal yield of the river by months for the past 31 years, the actual yield in the year 1927, and the excess or deficiency in each month. The drainage area of the Nashua River above the point of measurement was 119 square miles from 1897 to 1907 and 118.19 square miles from 1908 to 1913, inclusive. Since January 1, 1914, the city of Worcester has been diverting water from 9.35 square miles of this drainage area for the supply of that city, leaving the net drainage area 108.84 square miles.

Table showing the Average Daily Yield of the South Branch of the Nashua River for Each Month in the Year 1927, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1927.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.798	1.162	1.895	1.224	+ .097	+ .062
February	1.998	1.291	1.714	1.108	— .284	— .183
March	4.043	2.614	3.614	2.336	— .429	— .278
April	3.398	2.196	1.498	.968	—1.900	—1.228
May	1.995	1.290	1.408	.910	— .587	— .380
June	1.222	.790	.665	.430	— .557	— .360
July . . . . .	.730	.472	.864	.559	+ .134	+ .087
August . . . . .	.661	.427	2.494	1.612	+1.833	+1.185
September . . . . .	.582	.376	1.867	1.207	+1.285	+ .831
October . . . . .	.725	.469	1.710	1.105	+ .985	+ .636
November	1.273	.823	4.052	2.619	+2.779	+1.796
December	1.843	1.191	3.948	2.552	+2.105	+1.361
Average for whole year	1.688	1.091	2.149	1.389	+ .461	+ .298

The rainfall on the Nashua River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1922 to 1927, inclusive, together with the average for the past 31 years, are given in the following table:

Rainfall, in Inches, received and collected on the Nashua River Drainage Area.

MONTH.	1922.			1923.			1924.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	2.40	1.058	44.0	7.95	3.146	39.6	4.23	3.346	79.2
February	3.77	1.624	43.0	2.30	1.617	70.5	3.31	1.332	40.3
March	6.21	5.960	96.0	3.29	5.478	166.3	2.41	3.028	125.6
April	2.19	4.108	187.6	5.52	5.244	95.0	6.58	7.262	110.4
May	4.78	3.511	73.5	1.44	2.339	162.1	3.55	3.519	99.0
June	9.22	3.838	41.6	3.51	1.062	30.3	1.13	.775	68.4
July	4.91	2.672	54.5	3.72	.529	14.2	2.60	.234	9.0
August	5.59	1.419	25.4	2.04	.264	12.9	4.61	.449	9.7
September	2.77	.891	32.2	1.04	.159	15.3	4.79	.552	11.5
October	2.41	.774	32.1	5.16	.766	14.9	0.09	.114	122.5
November	1.59	.912	57.3	5.87	1.682	28.7	3.30	.476	14.4
December	4.02	.987	24.5	5.07	3.062	60.4	2.03	.702	34.6
Totals and averages	49.86	27.754	55.7	46.91	25.348	54.0	38.63	21.789	56.4

Rainfall, in Inches, received and collected on the Nashua River Drainage Area.—

Concluded.

MONTH.	1925.			1926.			1927.			MEAN FOR THIRTY-ONE YEARS, 1897-1927.		
	Rain- fall.	Rain- fall col- lected.	Per Cent col- lected.	Rain- fall.	Rain- fall col- lected.	Per Cent col- lected.	Rain- fall.	Rain- fall col- lected.	Per Cent col- lected.	Rain- fall.	Rain- fall col- lected.	Per Cent col- lected.
January . . .	3.68	.563	15.3	2.64	1.695	64.1	3.34	2.184	65.5	3.65	2.074	56.9
February . . .	2.27	2.524	111.3	5.77	1.340	23.2	4.63	1.784	38.6	3.85	2.096	54.4
March . . .	5.81	4.005	69.0	2.92	3.366	115.1	1.71	4.167	244.4	3.98	4.664	117.1
April . . .	3.06	2.482	81.1	2.46	4.165	169.4	2.10	1.669	79.7	3.83	3.793	99.1
May . . .	2.14	1.262	58.8	2.00	1.471	73.6	3.04	1.623	53.3	3.30	2.301	69.8
June . . .	3.97	.684	17.2	2.05	.699	34.2	2.17	.742	34.2	3.76	1.364	36.3
July . . .	3.95	.417	10.6	2.93	.461	15.7	5.94	.997	16.8	4.15	.842	20.3
August . . .	2.04	.347	17.0	2.90	.449	15.5	9.48	2.875	30.3	4.09	.762	18.7
September . . .	4.26	.596	14.0	1.43	.347	24.2	3.51	2.086	59.4	3.62	.650	17.9
October . . .	4.37	.779	17.8	4.69	.691	14.7	5.02	1.972	39.2	3.26	.836	25.6
November . . .	3.43	1.378	40.2	5.32	1.512	28.4	7.50	4.521	60.3	3.80	1.422	37.4
December . . .	4.39	2.897	65.9	4.20	1.162	27.7	6.23	4.552	73.0	4.07	2.126	52.2
Totals and averages . . .	43.37	17.934	41.3	39.31	17.358	44.2	54.67	29.172	53.4	45.36	22.930	50.6

The following table gives the record of the yield of the Nashua River watershed in gallons per day per square mile for each of the past six years and the mean for the past 31 years:

Yield of the Nashua River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1922.	1923.	1924.	1925.	1926.	1927.	Mean for Thirty- one Years, 1897-1927.
January . . .	593,000	1,764,000	1,876,000	316,000	951,000	1,224,000	1,162,000
February . . .	1,008,000	1,004,000	798,000	1,566,000	831,000	1,108,000	1,291,000
March . . .	3,341,000	3,071,000	1,697,000	2,245,000	1,887,000	2,336,000	2,614,000
April . . .	2,383,000	3,042,000	4,213,000	1,440,000	2,416,000	968,000	2,196,000
May . . .	1,968,000	1,311,000	1,973,000	708,000	825,000	910,000	1,290,000
June . . .	2,223,000	615,000	449,000	396,000	405,000	430,000	790,000
July . . .	1,498,000	297,000	131,000	234,000	258,000	559,000	472,000
August . . .	795,000	148,000	252,000	194,000	252,000	1,612,000	427,000
September . . .	516,000	92,000	320,000	345,000	201,000	1,207,000	376,000
October . . .	434,000	430,000	64,000	437,000	387,000	1,105,000	469,000
November . . .	528,000	974,000	276,000	799,000	876,000	2,619,000	823,000
December . . .	553,000	1,717,000	394,000	1,624,000	651,000	2,552,000	1,191,000
Average for whole year . . .	1,321,000	1,207,000	1,035,000	854,000	826,000	1,389,000	1,091,000
Average for driest six months . . .	723,000	424,000	239,000	386,000	389,000	949,000	558,000

¹ The drainage area used in making up these records included water surfaces amounting to 2.2 per cent of the whole area from 1897 to 1902, inclusive, to 2.4 per cent in 1903, to 3.6 per cent in 1904, to 4.1 per cent in 1905, to 5.1 per cent in 1906, to 6 per cent in 1907, to 7 per cent in 1908, 1909 and 1910, to 6.5 per cent in 1911, to 6.8 per cent in 1912, to 7 per cent in 1913, to 7.4 per cent in 1914 and 1915, to 7.6 per cent in 1916, to 7.4 per cent in 1917 and 1918, to 7.5 per cent in 1919, 1920, 1921 and 1922, to 7.4 per cent in 1923 and 1924, to 6.4 per cent in 1925, to 5.9 per cent in 1926 and 5.7 per cent in 1927.

Nashua and Sudbury Rivers.

The records of the flow of the Sudbury River are available beginning with 1875. The measurements of the flow of the South Branch of the Nashua were not begun until 1897. The following table shows a comparison of the average flow of these rivers during the period since the Nashua River measurements were begun and also the comparative flow of each stream in the year 1927.

Table showing Comparative Flow of the Nashua and Sudbury Rivers in 1927 and the Average Flow of those Streams in the 31 Years from 1897 to 1927, inclusive, in Gallons per Day per Square Mile.

	SUDBURY RIVER.			NASHUA RIVER.		
	Normal Flow, 1897-1927.	Actual Flow, 1927.	Excess or Deficiency.	Normal Flow, 1897-1927.	Actual Flow, 1927.	Excess or Deficiency.
January	1,120,000	1,297,000	+177,000	1,162,000	1,224,000	+62,000
February	1,551,000	1,462,000	-89,000	1,291,000	1,108,000	-183,000
March	2,700,000	2,054,000	-646,000	2,614,000	2,336,000	-278,000
April	1,967,000	692,000	-1,275,000	2,196,000	968,000	-1,228,000
May	1,094,000	768,000	-326,000	1,290,000	910,000	-380,000
June	497,000	215,000	-282,000	790,000	430,000	-360,000
July	198,000	130,000	-68,000	472,000	559,000	+87,000
August	229,000	946,000	+717,000	427,000	1,612,000	+1,185,000
September	241,000	1,307,000	+1,066,000	376,000	1,207,000	+831,000
October	389,000	1,297,000	+908,000	469,000	1,105,000	+636,000
November	783,000	4,026,000	+3,243,000	823,000	2,619,000	+1,796,000
December	997,000	2,764,000	+1,767,000	1,191,000	2,552,000	+1,361,000
Average for whole year	977,000	1,411,000	+434,000	1,091,000	1,389,000	+298,000
Average for driest six months	388,000	676,000	+288,000	558,000	949,000	+391,000

Merrimack River.

The Merrimack River is the second in size of the streams of Massachusetts. The river rises in the White Mountains of New Hampshire and flows southerly through the central part of that State until it enters Massachusetts, where it turns to the east and flows in a general northeasterly direction the remainder of its course to the sea. The total length of its watershed from its extreme northerly limits in the mountains of northern New Hampshire to its extreme southerly limits in the hills of Hopkinton, Massachusetts, is about 137 miles and its extreme width about 66 miles. Its total drainage area above its mouth at Newburyport is about 5,000 square miles, of which about one-quarter is within the limits of Massachusetts and the remainder within the State of New Hampshire.

Records of the flow of the Merrimack River have been kept continuously at Lawrence since 1880. The drainage area of the river at that point is 4,663 square miles, including 118.19 square miles tributary to the South Branch of the Nashua River used for the water supply of the Metropolitan District and in part for the city of Worcester, 75.2 square miles on the Sudbury River, and 18 square miles tributary to Lake Cochituate. The flow as measured at Lawrence includes the water wasted from these drainage areas. In the year 1927 practically all of the water from the southern Sudbury drainage area and a large part of that from Lake Cochituate was wasted into the stream, but no water whatever was wasted from Wachusett Reservoir into the Nashua River except such as was discharged from the reservoir under the provisions of the Metropolitan water supply act. In presenting the record of the flow of the river these drainage areas have been deducted, leaving the net drainage area above Lawrence 4,567 square miles in 1880, 4,570 square miles in the years 1891 to 1897, inclusive, and 4,452 square miles since the latter year. The quantity of water overflowing from the Cochituate and Sudbury watersheds as measured by the Metropolitan District Commission has also been deducted from the flow of the river as measured at Lawrence. The average flow of the river during the year 1927 amounted to 1.633 cubic feet per second per square mile, or 1,056,000 gallons per day per square mile of drainage area, which is about 11.3 per cent above the normal for the past 48 years. The flow exceeded the normal in March and during the months of August to December, inclusive; the greatest deficiency occurred in April.

The following table shows the relation between the normal flow of this stream during the past 48 years and the actual flow during each month of the year 1927.

Table showing the Average Monthly Flow of the Merrimack River at Lawrence for the Year 1927, in Cubic Feet per Second per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	Normal Flow, 1880-1927.	Actual Flow in 1927.	Excess or Deficiency.
January	1.247	.955	— .292
February	1.336	1.047	— .289
March	2.753	3.161	+ .408
April	3.504	1.828	—1.676
May	2.224	1.417	— .807
June	1.239	.785	— .454
July . . . . .	.756	.645	— .111
August . . . . .	.644	.708	+ .064
September . . . . .	.640	.949	+ .309
October . . . . .	.796	1.355	+ .559
November	1.153	3.733	+2.580
December	1.306	3.015	+1.709
Average for whole year	1.467	1.633	+ .166

The following table gives the record of the flow of the Merrimack River at Lawrence for each of the past six years, together with the average flow for the past 48 years, this amount being expressed in cubic feet per second per square mile of drainage area:

Flow of the Merrimack River at Lawrence in Cubic Feet per Second per Square Mile.

MONTH.	1922.	1923.	1924.	1925.	1926.	1927.	Mean for Forty-eight Years, 1880-1927.
January . . . . .	.830	1.074	1.964	.357	1.027	.955	1.247
February . . . . .	.887	.855	.978	1.882	.796	1.047	1.336
March	3.900	1.956	1.767	3.413	1.648	3.161	2.753
April	4.903	4.958	5.050	3.102	3.933	1.828	3.504
May	2.887	2.904	3.115	1.349	2.165	1.417	2.224
June	3.006	.730	.920	.689	.843	.785	1.239
July	2.111	.434	.464	.712	.527	.645	.756
August . . . . .	.773	.394	.350	.518	.405	.708	.644
September . . . . .	.766	.303	.753	.454	.341	.949	.640
October . . . . .	.660	.491	.612	.735	.509	1.355	.796
November . . . . .	.612	1.177	.536	1.067	1.395	3.733	1.153
December . . . . .	.498	2.372	.712	1.577	.872	3.015	1.306
Average for whole year	1.819	1.471	1.435	1.321	1.205	1.633	1.467
Average for driest six months . . . . .	.903	.588	.571	.696	.670	.977	.871

Sudbury, Nashua and Merrimack Rivers.

The following table shows the weekly fluctuations during the year 1927 in the yield of the Sudbury River at Framingham, the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton, and the Merrimack River at Lawrence. The flow of these streams, particularly that of the Sudbury River and the South Branch of the Nashua River, serves to indicate the flow of other streams in eastern Massachusetts. The area of the Sudbury River watershed is 75.2 square miles, of the South Branch of the Nashua River 118.19 square miles, and of the Merrimack River at Lawrence 4,452 square miles.

Table showing the Average Weekly Flow of the Sudbury, South Branch of the Nashua and the Merrimack Rivers for the Year 1927, in Cubic Feet per Second per Square Mile of Drainage Area.

WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.	WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.
Jan. 2	3.379	1.038	.846	July 3 . . . .	.217	.487	.564
9	1.944	1.073	.856	10 . . . .	.010	.571	.555
16	1.463	1.158	.754	17 . . . .	.482	1.239	.724
23	2.942	2.807	.961	24 . . . .	.606	.664	.778
30	6.084	2.460	1.239	31 . . . .	.482	1.142	.620
Feb. 6	4.571	2.258	1.285	Aug. 7 . . . .	.319	2.365	.724
13	1.817	1.371	1.004	14	3.074	2.119	.603
20	1.959	1.594	.896	21 . . . .	.536	.894	.553
27	2.639	1.964	1.000	28	1.645	3.982	.644
Mar. 6	3.616	1.375	1.170	Sept. 4	5.920	4.969	1.684
13	4.226	4.464	1.749	11	5.273	1.591	1.083
20	4.550	5.811	5.586	18	1.518	1.336	.748
27	3.072	3.464	4.308	25	1.484	1.282	.685
Apr. 3	1.642	1.789	2.251	Oct. 2	1.437	.677	.572
10	1.273	1.520	1.893	9 . . . .	.987	1.449	.792
17 . . . .	.723	1.033	1.489	16	3.309	2.817	1.394
24	1.106	1.731	1.929	23	4.416	2.021	1.938
May 1	1.186	1.625	1.799	30	3.292	1.009	1.598
8 . . . .	.762	1.191	1.176	Nov. 6	10.093	8.144	4.746
15 . . . .	.908	1.353	1.274	13	11.470	2.453	4.478
22	1.794	1.438	1.761	20	8.330	3.099	2.928
29	1.657	1.796	1.540	27	7.795	2.570	2.815
June 5	1.201	.990	1.098	Dec. 4	6.037	3.103	2.989
12 . . . .	.533	.674	.997	11	4.743	4.652	3.533
19 . . . .	.534	.560	.714	18	6.272	6.002	3.668
26 . . . .	.590	.642	.547	25	5.498	2.446	2.617

EXAMINATION OF RIVERS.

Owing to the excessive rainfall in the latter half of the year 1927 the examinations of the rivers were confined for the most part to the months of July to September or October, inclusive.

Aberjona River.

Considerable work has been done during the past year in the construction of a new sewer in the Aberjona River valley, but at the end of the year this sewer was not ready for use. All the wastes from the tanneries in this valley have been discharged into the river with little or no treatment and the quantity of organic matter in the stream above Winchester has been much greater than in any year since the records were begun. During the period of excessive rainfall in the latter part of the year sewage overflowed from manholes for a time into the river in Winchester.

Assabet River.

Below Westborough there has been an increase in the amount of organic matter in the water of the Assabet River, and the effect was noticeable down to the town of Hudson. Below Hudson the analyses indicate an improvement in the character of the water as compared with the previous year. There has been slightly less evidence of pollution below Maynard than in recent years, while farther down stream the character of the water has been about as usual. The river is still badly polluted.

Blackstone River.

The analyses of the water of the Blackstone River do not as yet indicate any marked improvement in the condition of the river water below the Worcester sewage disposal works. Farther down stream there has been a considerable increase in the quantity of putrescible organic matter in the water, and at the point where it leaves the State a larger quantity of organic matter has been present than in any year since the examinations were begun in 1887.

No samples of the water were collected for analysis after the heavy freshet in November.

Charles River.

The Charles River below Milford has shown more evidence of pollution than usual since the sewage disposal works were constructed, while below Medway more organic matter has been present in the water than in any year since 1918. At the Medfield State Hospital the evidences of pollution continue to increase as compared with earlier years, and the same is true at various points lower down in the course of the river.

Chicopee River and Tributaries.

The analyses during 1927 have shown no changes of any consequence at any point throughout the course of this river and its tributaries.

Concord and Sudbury Rivers.

Bannister Brook, a tributary of the Sudbury River which receives the effluent from the sewage disposal works at Natick and Framingham, shows more evidence of pollution than in previous years. The water of the Sudbury River below Saxonville has contained more organic matter than in any recent year, while at the confluence with the Assabet River at Concord there was more evidence of pollution than in any year since 1915. The analyses of the water of the Concord River show no material change, though there is an indication of a slight improvement in the character of the water of this stream at its mouth.

Connecticut River.

The analyses of the waters of the Connecticut River show no material change from other recent years.

French River.

The water of the French River below Webster and Dudley has contained more putrescible organic matter as indicated by the albuminoid ammonia than in any year since 1918. No further action appears to have been taken relative to the construction of the sewage disposal works for Webster and Dudley which were approved by this Department in 1925.

Hoosick River.

The results of the analyses of samples of the water of the Hoosick River below North Adams and at Williamstown show that its condition continues to be objectionable. Plans were submitted during the year for a change in certain sewer outlets at North Adams, but due to the flood in November no important changes have as yet been recommended.

Housatonic River.

Only a limited number of analyses have been made of the water of the Housatonic River during the year. These examinations show in general a slight increase in pollution as compared with recent years. The most marked increase occurred in the water of the East Branch of the river below Pittsfield.

Merrimack River.

The results of the analyses of samples of the water of the Merrimack River during 1927 indicated an increase in the quantity of organic matter as compared with previous years. Above Lawrence there was more evidence of pollution than usual, and below that city more organic matter was present in the water than any year since 1915. The analyses of the water of the Shawsheen River at its mouth have shown a gradual improvement due apparently to the removal of the sewage of the town of Andover from this river. Above Haverhill the amount of dissolved oxygen present in the water has been lower than in any year since 1923, while the effect of the sewage discharged into the river has been more noticeable below Haverhill than for several years.

Millers River and Tributaries.

The Otter River below Gardner, a tributary of the Millers River, has shown a marked increase in pollution due chiefly to the discharge of imperfectly treated sewage from the Gardner sewage disposal works. Further improvements at the

sewage disposal works of the city of Gardner are necessary if this stream is to be kept in a satisfactory condition. A sewerage system and sewage disposal works were constructed during the past year by the town of Winchendon. The plant was put into operation at the end of the year, but thus far only a few sewer connections have been made. Below Athol and Orange there has been but little change in the condition of the river as compared with earlier years.

Nashua River.

The results of the analyses of samples of water from the North Branch of the Nashua River show in general a greater degree of pollution than in any year since 1915. This appears to be due in part to industrial wastes but more particularly to the sewage of the city of Leominster which is discharged untreated into the stream. Samples of the water of Monoosnock Brook below the main sewer outlet of the city of Leominster indicate that on the average the flow in the brook consisted of about one-third domestic sewage.

The city of Leominster during the past year constructed a sewerage system in the Whalom district of that city which has been connected with the Fitchburg sewage disposal works. The condition of the North Branch of this river is very objectionable.

The effect of discharge of untreated sewage from Clinton into the South Branch of the Nashua River has also been noticeable, and the water of the main stream as it leaves the State has contained more organic matter than in any year so far recorded.

Neponset River.

The results of the investigation of the condition of the Neponset River have shown a very general increase in pollution throughout its course from a point near Walpole Center to its mouth. Its two main tributaries, Hawes Brook and the Canton River, have also shown more evidence of pollution than in the previous year. The quantity of albuminoid ammonia in the river below the entrance of Hawes Brook in Norwood was greater than in any year since 1913.

Complaint was made during the year relative to the condition of the river at various points in its course. The Department has recommended the extension of the Metropolitan sewer to the towns in the upper portion of this valley as the best practicable method of effecting an adequate improvement in the condition of this river.

Taunton River and Tributaries.

The results of the analyses of the waters of this river and its tributaries, particularly the Coweaset, Matfield and Town rivers, have shown a decided increase in pollution as compared with previous years. Complaints of organic growths in the Town River at Bridgewater were made during the year, and there has been litigation relative to the effect of the effluent from the Brockton sewage disposal works upon one of the tributaries of this stream.

Ten Mile River.

The condition of Ten Mile River has varied considerably from year to year, but in 1927 there was a marked increase in the amount of putrescible organic matter present in the river water below North Attleborough and at a point below Attleboro but above the Attleboro sewage filters. The sewage of North Attleborough is conveyed to disposal works, but there has been a marked deterioration in the quality of the effluent from these works and considerable quantities of sewage have been discharged into the river without treatment.

EXAMINATION OF SEWAGE DISPOSAL WORKS.

At Attleboro although a reasonably thorough distribution of sewage over the entire disposal area has been continued as last year, the results of operation have not been quite as satisfactory as in 1926.

At Brockton the larger proportion of sewage has been treated by the trickling filters and secondary tank, and much of the effluent from the secondary tank has been discharged upon the sand filter beds. Owing to the large amount of rain

during certain periods of the year there was an increase in the quantity of sewage requiring treatment. This increase has been taken care of by increasing considerably the quantity of sewage discharged upon the old sand filter beds, but there has been a reduction in the quantity passed through the trickling filter plant.

At Clinton the quantity of sewage has increased materially during the past year. The filter beds are not capable of treating satisfactorily all of the sewage, and large quantities have overflowed into the South Branch of the Nashua River. There has been a decided deterioration in the quality of the effluent discharged from the filters, as compared with earlier years.

At Easthampton all of the sewage has been passed through settling tanks as in previous years. Less than half of the sewage is filtered through the sand filter beds, while the larger part is discharged into the Manhan River without further treatment.

The new grit chamber at Fitchburg, which was constructed a year ago, has been in use throughout most of the year and has proved satisfactory in that it is practicable to treat more sewage at times of storm than was formerly the case.

At Framingham the old sand filters have not been operated as satisfactorily as usual and the quality of the effluent has shown deterioration.

At Franklin there has been a marked increase in the quantity and strength of the sewage during the year and in consequence the filters have been overdosed, with unsatisfactory results upon the quality of the effluent. A better system of distribution of the sewage and a larger area of filters have become necessary for the proper disposal of the sewage of this town.

The condition of the sewage disposal works at Gardner has remained about the same as in recent years. The work of relaying the underdrains in the filter beds was continued during the early part of the summer so that the entire underdrainage systems at both the Gardner and Templeton areas have been reconstructed. The purification of the sewage is not satisfactory, and the discharge of more or less improperly purified sewage into the Otter River has continued as in previous years.

At Milford various units of the sewage disposal works, including an Imhoff tank and a trickling filter, have been operated as usual and a secondary tank and sludge pumps were completed and first operated during the year. The Imhoff tank continues to give unsatisfactory results due to lack of proper attention. Considerable improperly purified sewage overflows from this section of the plant into the Charles River, and some untreated sewage is discharged into the river directly from the Milford sewerage system. There has been a marked falling off in the character of the effluent of the sand filters during the year.

At Natick conditions have been slightly less satisfactory than during the previous years due in part to an increase in the quantity and strength of the sewage. During the year 1926 seven of the filter beds were reconstructed and the work of reconstruction was carried on in the early part of 1927 on the remaining seven beds. Subsequently the filters were operated more satisfactorily and the quantity of sewage allowed to overflow without treatment has probably been less than in previous years. The disposal works are still inadequate for the proper treatment of all of the sewage of the town, and an additional area of filters should be provided.

At North Attleborough the operation of the filter beds has been unsatisfactory. The area of the filters has become inadequate for the disposal of the quantity of sewage now received at this plant, and should be increased without further delay. The filters appear to be badly clogged, and it has become necessary to allow large quantities of sewage to overflow into the swamp below the sewage disposal area.

At Northbridge the sewage disposal works were badly overloaded during the year 1926 and the effluent of the plant has deteriorated seriously during the past year. During 1927, in accordance with the recommendations of the Department, the underdrains were taken up and relaid in some eight of the filter beds and surface material was removed and replaced with a good quality of sand and gravel. The operation of the filters since the latter part of the summer has been more satisfactory than formerly.

At Norwood the filter beds have been used regularly throughout the year, but the area of the filters is not sufficient for the proper treatment of all the sewage of the town.

The sewage disposal works at Pittsfield have become inadequate for the effective treatment of the quantity of sewage now discharged from the city and much sewage is discharged untreated into the Housatonic River. There has been a falling off in the efficiency of the filtration of that portion of the sewage discharged to the filter beds.

At Southbridge the six new filter beds with an aggregate area of four acres which were constructed in 1925-1926 have been in use throughout the year, but the plant as a whole is inadequate for the proper treatment of all the sewage of the town.

The area of the filters at Westborough still continues to be inadequate for the treatment of all the sewage, and untreated or improperly purified sewage has overflowed at times into the Assabet River.

At Worcester the new sewage disposal plant has been in constant use throughout the year. The quantity of sludge collecting in the Imhoff tanks continues to be large, but improvement has been shown in the operation of the tanks, and the sludge has been disposed of satisfactorily upon the old sand filter beds. The trickling filters have operated more satisfactorily during the year, especially since the removal of some of the small stone and dirt which had collected upon the surface. There has been less pooling of sewage upon the beds particularly since the latter part of the summer. The secondary tanks have become more efficient due to the installation of satisfactory pumping apparatus for the removal of the sludge from these tanks.

The other larger municipal sewage disposal works have given reasonable satisfaction during the year, but extensions should be made at some of the smaller works. The average results of the analyses of sewage and effluent, together with statistics concerning the more important sewage disposal works, are presented in the following tables:

TABLE No. 1. — *Average Results of the Analyses of Monthly Samples of Sewage as received at Disposal Works. (Fats determined in about 53 Per Cent of the Samples.)*

[Parts in 100,000.]

CITY OR TOWN.	RESIDUE ON EVAPORATION.						AMMONIA.			Chlorine.		OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.			Unfil-tered.	Fil-tered.	Unfil-tered.	Fil-tered.			
	Total.	Dis-solved.	Sus-pended.	Total.	Dis-solved.	Sus-pended.		Total.	Dis-solved.	Sus-pended.							
ATTLEBORO ¹	38.57	27.97	10.60	18.40	10.50	7.90	2.53	.65	.32	.33	3.78	2.08	.300	.085	1.09	8.42	
BROCKTON ²	38.72	26.25	12.47	18.95	8.70	10.25	3.05	.69	.30	.39	5.33	1.78	.097	.039	1.28	3.53	
Clinton ²	217.46	100.75	116.71	136.48	44.57	91.91	3.37	2.82	1.15	1.67	6.07	10.48	.275	.083	5.23	54.99	
Concord ¹	31.90	23.73	8.17	16.10	10.03	6.07	2.59	.72	.34	.38	3.53	4.53	.093	.041	1.30	—	
Easthampton ¹	47.30	29.67	17.63	28.20	12.77	15.43	2.82	.81	.41	.40	4.08	5.95	.087	.037	1.33	—	
FITCHBURG	48.42	27.03	21.39	24.07	11.68	12.39	1.98	.72	.34	.38	4.17	5.02	.373	.121	1.16	6.85	
Frammingham (Imhoff) ³	63.86	42.53	21.33	31.63	18.53	13.10	3.77	1.24	.73	.51	5.59	7.97	.158	.058	1.91	6.34	
Frammingham ²	101.52	51.83	49.69	59.97	25.68	34.29	4.07	1.82	1.05	.77	6.14	14.08	.378	.089	3.14	14.68	
Franklin ¹	70.94	47.90	23.04	43.17	26.06	17.11	4.29	1.28	.59	.69	5.40	8.75	.106	.049	2.05	—	
GARDNER (Gardner Area) ^{1,4}	72.35	44.50	27.85	43.60	20.90	22.70	6.58	1.13	.74	.39	5.70	9.50	.219	.073	2.48	14.68	
GARDNER(Templeton Area)	55.78	33.53	22.25	31.12	14.40	16.72	5.29	1.11	.59	.52	4.96	7.16	.123	.047	2.05	6.99	
Hopedale ^{1,2}	63.87	37.97	25.90	37.87	17.64	20.23	5.54	1.49	.71	.78	6.00	8.90	.164	.046	1.99	—	
Hudson	71.55	37.08	34.77	44.70	15.97	28.73	6.75	1.54	.90	.64	5.64	9.35	.125	.041	2.73	10.40	
Leicester ⁴	42.60	30.75	11.85	23.70	15.80	7.90	1.51	.52	.35	.17	2.25	6.42	.251	.040	1.04	—	
Marion ^{1,4}	33.53	24.67	8.86	16.23	9.50	6.73	2.56	.88	.47	.41	4.80	4.25	.065	.027	.84	—	
MARLBOROUGH.	61.00	39.91	21.09	32.07	15.48	16.59	2.98	1.08	.56	.52	6.99	6.81	.187	.061	1.63	8.37	
Milford	41.18	29.38	11.90	19.25	9.52	9.73	3.66	.71	.37	.34	4.73	4.39	.111	.090	1.38	—	
Natick ²	60.05	40.45	19.60	26.38	13.80	12.58	3.18	.79	.38	.41	7.49	4.52	.155	.038	1.33	5.96	
North Attleborough ¹	31.10	22.70	8.40	14.93	8.77	6.16	1.74	.63	.33	.30	3.45	3.10	.084	.033	.85	—	
Northbridge ¹	41.50	24.15	17.35	21.13	11.99	9.14	3.60	.86	.47	.39	2.91	4.72	.087	.033	1.62	—	
Norwood	147.38	71.82	75.56	77.40	22.93	54.47	2.94	1.80	.77	1.03	20.07	17.82	.218	.060	3.42	30.07	
PITTSFIELD ²	46.40	37.53	8.87	22.07	15.57	6.50	2.55	.67	.36	.31	5.35	4.88	.085	.036	1.23	4.08	
Southbridge ¹	63.20	41.50	21.70	36.17	18.47	17.70	3.91	1.14	.46	.68	6.53	7.68	.095	.034	2.03	11.07	
Spencer ¹	95.80	34.93	60.87	63.83	16.43	47.40	2.83	2.04	.82	1.22	4.10	17.92	.344	.082	3.74	22.03	
Stockbridge ⁴	29.65	26.35	3.30	14.35	11.80	2.55	1.71	.36	.23	.13	1.70	2.82	.150	.040	.54	—	
Westborough	99.13	70.17	28.96	51.21	26.27	24.94	3.02	1.16	.59	.57	15.03	17.49	.203	.102	2.00	10.43	
WORCESTER ⁵	93.98	62.69	31.29	33.51	14.47	19.04	2.07	.83	.32	.51	9.46	3.39	6.91	2.37	1.62	—	

¹ Six samples.
² At pumping station.

³ Entrance to Imhoff tanks, including Saxonville sewage.
⁴ Four samples.

⁵ Nine samples.

TABLE No. 2. — *Average Results of the Analyses of Monthly Samples of Sewage as Applied to Filter Beds after Preliminary Treatment as Indicated. (Fats determined in about 53 Per Cent of the Samples.)*

[Parts in 100,000.]																		
CITY OR TOWN.	Form of Preliminary Treatment.	RESIDUE ON EVAPORATION.						AMMONIA.			OXYGEN CONSUMED.		IRON.		Fats.			
		TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.		Unfiltered.	Filtered.	Kjeldahl Nitrogen.					
		Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.											
ATTLEBORO ¹ .	None	38.57	27.97	10.60	18.40	10.50	7.90	2.53	.65	.32	.33	3.78	4.38	2.68	3.00	.085	1.09	8.42
BROCKTON	Tanks	35.28	29.88	5.40	14.65	10.50	4.15	3.18	.55	.30	.25	5.76	3.30	1.92	.096	.43	.95	2.36
CLINTON	Basins	72.04	60.13	11.91	34.58	25.60	8.98	2.56	.93	.62	.31	5.80	7.85	5.50	.136	.065	1.61	10.08
CONCORD ¹	None	31.90	23.73	8.17	16.10	10.03	6.07	2.59	.72	.34	.38	3.53	4.53	2.48	.093	.041	1.30	—
EASTHAMPTON ¹	Tanks	39.63	30.83	8.80	20.53	13.33	7.20	2.67	.71	.36	.35	4.07	4.82	2.40	.075	.030	1.20	—
FITCHBURG	Imhoff	31.43	25.42	6.01	12.62	9.54	3.08	1.98	.47	.26	.21	4.31	3.46	2.33	.258	.112	.83	3.05
FRAMMINGHAM	Imhoff	45.90	38.82	7.08	20.25	15.62	4.63	3.67	.75	.46	.29	5.48	4.93	3.13	.143	.055	1.07	4.29
FRANKLIN	Tanks	38.53	31.53	7.00	14.36	9.96	4.40	3.07	.55	.31	.24	6.57	3.75	2.64	.079	.040	1.06	—
GARDNER (Gardner Area)	None	72.35	44.50	27.85	43.60	20.90	22.70	6.58	1.13	.74	.39	5.70	9.50	4.70	.219	.073	2.48	14.68
GARDNER (Templeton Area)	Tanks	33.63	27.53	6.10	15.33	10.35	4.98	3.18	.60	.30	.30	4.39	3.35	2.03	.123	.055	1.02	2.64
HOPEDALE ¹	Tanks	37.27	26.70	10.57	19.03	11.43	7.60	4.82	.70	.37	.33	4.20	4.18	2.53	.114	.051	1.20	—
HUDSON.	Tanks	39.75	31.75	8.00	19.40	13.18	6.22	3.92	.70	.38	.32	4.90	4.10	2.53	.086	.040	1.25	4.97
LEICESTER ²	None	42.60	30.75	11.85	23.70	15.80	7.90	1.51	.52	.35	.17	2.25	6.42	4.60	.251	.040	1.04	—
MARION ¹	None	33.53	24.67	8.86	16.23	9.50	6.73	2.56	.88	.47	.41	4.80	4.25	2.49	.065	.027	.84	5.32
MARLBOROUGH	Tanks	52.00	40.28	11.72	22.50	14.35	8.15	3.52	.82	.44	.38	7.78	5.26	2.88	.151	.061	1.35	—
MILFORD.	Tanks	35.10	30.02	5.08	13.80	9.68	4.12	2.61	.50	.28	.22	5.13	3.02	2.08	.077	.028	.79	—
MILFORD	Imhoff	29.02	25.90	3.12	9.82	7.38	2.44	2.44	.41	.23	.18	4.43	2.13	1.34	.065	.027	.63	—
NATICK	None	60.05	40.45	19.60	26.38	13.80	12.58	3.18	.79	.38	.41	7.49	4.52	2.08	.155	.038	1.33	5.96
NORTH ATTLEBOROUGH ¹	Tanks	23.20	20.23	2.97	8.80	6.83	1.97	1.54	.45	.21	.24	3.30	1.69	0.95	.066	.029	.37	—
NORTHBRIDGE.	Tanks	21.60	16.57	5.03	10.60	7.32	3.28	2.15	.46	.22	.24	2.43	2.38	1.44	.078	.036	.73	—
NORWOOD	Tank	68.81	55.13	13.68	28.78	19.05	9.73	2.69	.78	.39	.39	13.69	7.86	4.81	.120	.049	1.44	7.17
PITTSFIELD	None	46.40	37.53	8.87	22.07	15.57	6.50	2.55	.67	.36	.31	5.35	4.88	2.83	.085	.036	1.23	4.08
SOUTHBRIDGE ¹	Tanks	47.43	38.50	8.93	24.13	16.70	7.43	2.73	.77	.41	.36	5.40	4.98	3.02	.101	.043	1.34	5.99
SPENCER ¹	None	96.80	34.93	60.87	63.83	16.43	47.40	4.53	2.04	.92	1.22	4.10	17.92	5.80	.344	.082	3.74	22.03
STOCKBRIDGE ²	None	29.65	26.35	3.30	14.35	11.80	2.55	1.71	.36	.23	.13	1.70	2.82	1.50	.040	.019	.54	—
WESTBOROUGH	None	99.13	70.17	28.96	51.21	26.27	24.94	3.02	1.16	.59	.57	15.03	10.63	2.03	.293	.102	2.00	10.43
WORCESTER ³	Imhoff	64.27	49.62	14.65	16.87	8.82	8.05	2.16	.54	.23	.31	8.98	5.22	2.17	4.187	.366	.93	—
: Four samples.																		
: Six samples.																		
: Nine samples.																		

¹ Six samples.

² Four samples.

³ Nine samples.

TABLE NO. 3. — *Efficiency of Settling Tanks and Other Forms of Preliminary Treatment as indicated by the Foregoing Tables.*

[Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	SUSPENDED SOLIDS.			TOTAL ALBUMINOID AMONIA.			OXYGEN CONSUMED.			FATS. ¹			CHLORINE.	
		Raw Sewage.	Settled or Treated Sewage.	Per Cent Removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent Removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent Removed.	Raw Sewage.	Settled or Treated Sewage.	Per Cent Removed.	Raw Sewage.	Settled or Treated Sewage.
BROCKTON .	Tanks	12.47	5.40	57	.69	.55	20	3.97	3.30	17	3.53	2.36	33	5.33	5.76
Clinton .	Basins	116.71	11.91	90	2.82	.93	67	22.48	7.85	65	54.99	10.08	82	6.07	4.85
Easthampton .	Tanks	17.63	8.80	50	.81	.71	12	5.95	4.82	19	—	—	—	4.08	4.07
Fitchburg .	Imhoff	21.39	6.01	72	1.72	.47	35	5.02	3.46	31	6.85	3.05	55	4.17	4.31
Framingham ² .	Imhoff	21.33	7.08	67	1.24	.75	40	7.97	4.93	38	6.34	4.29	32	5.59	5.48
Franklin .	Tanks	23.04	7.00	70	1.28	.55	57	14.58	3.75	74	—	—	—	5.40	6.57
GARDNER (Templeton Area)	Tanks	22.25	6.10	73	1.11	.60	46	7.16	3.35	53	6.99	2.64	62	4.98	4.39
Hopedale .	Tanks	25.90	10.57	59	1.49	.70	53	8.90	4.18	53	—	—	—	6.00	4.20
Hudson .	Tanks	34.77	8.00	77	1.54	.70	55	9.35	4.10	56	10.40	4.97	52	5.64	7.90
MARLBOROUGH .	Tanks	21.09	11.72	44	1.08	.82	24	6.81	5.26	23	8.37	5.32	36	6.99	7.78
Milford .	Tanks	11.80	5.08	57	.71	.50	30	4.39	3.02	31	—	—	—	4.73	5.13
Milford .	Imhoff	11.80	3.12	74	.74	.41	42	4.39	2.13	51	—	—	—	4.73	4.43
North Attleborough .	Tanks	8.40	2.97	65	.63	.45	29	3.10	1.69	45	—	—	—	3.45	3.30
Northbridge .	Tanks	17.35	5.03	71	.86	.46	46	4.72	2.38	50	—	—	—	2.91	2.43
Norwood .	Tank	75.56	13.68	82	1.80	.78	57	17.82	7.86	56	30.07	7.17	76	20.07	13.69
Southbridge .	Tanks	21.70	8.93	59	1.14	.77	32	7.68	4.98	35	11.07	5.99	46	6.53	5.40
WORCESTER	Imhoff	31.29	14.65	53	.83	.54	35	9.58	5.22	46	—	—	—	9.46	8.98

¹ Fats determined in about 53 per cent of samples.

² The analyses of the comparatively small quantity of sewage from Saxonville not used in determining the efficiency of these tanks.

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Tricking Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc.*
 [Parts in 100,000.]
Brockton.

	RESIDUE ON EVAPORATION.						AMMONIA.			Chlorine.		NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.		
	TOTAL RESIDUE.			LOSS ON IGNITION.			ALBUMINOID.			Free.	Total.	Dissolved.	Suspended.	Nitrates.	Nitrites.				Unfiltered.	Filtered.
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.														
Settled sewage as applied to trickling filter.	35.28	29.88	5.40	14.65	10.50	4.15	3.18	.55	.30	.25	5.76	—	—	3.30	1.92	.95	2.36	Trickling filter has an area of 20 acres and a depth of 10 feet of stone from 1.5 to 3 inches in size.		
Effluent from trickling filter.	38.53	32.57	5.96	15.42	10.78	4.64	1.92	.42	.19	.23	6.52	.0268	1.4462	2.99	1.32	.82	1.42	One-half of filter used alternately. The average rate of operation was about 1,037,000 gallons per acre per day.		
Per cent removed Settled effluent from trickling filter.	—	—	—	—	—	—	40	24	37	8	—	—	—	9	31	14	40	Period of sedimentation averages about 1.55 hours.		
	38.10	32.03	6.07	13.87	10.53	3.34	1.89	.34	.18	.16	7.23	.0241	1.4019	2.73	1.45	.65	1.46			
Per cent removed by tank.	1	2	—	10	2	28	2	19	5	30	—	—	—	9	—	21	—			
Per cent removed by trickling filter and settling tank.	—	—	—	5	—	19	41	38	40	36	—	—	—	17	24	32	38	Tanks cleaned 52 times.		

TABLE NO. 4. — Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc. — Continued.
 (Parts in 100,000.)
 Fitchburg.

	RESIDUE ON EVAPORATION.						AMMONIA.						Chlorine.	NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.			Nitrates.	Nitrites.		Unfiltered.	Filtered.					
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.														
Imhoff tank effluent as applied to trickling filter.	31.43	25.42	6.01	12.62	9.54	3.08	1.98	.47	.26	.21	4.31	—	3.46	2.33	.83	3.05	Trickling filter has an area of 2.14 acres and a depth of 10 feet of stone from 1 to 3 inches in size.			
Effluent from trickling filter.	29.83	25.72	4.11	12.18	9.90	2.28	.56	.26	.14	.12	4.35	1.2425	1.67	1.01	.47	—	The average rate of operation was about 2,037,000 gallons per day for area used (1.86 acres).			
Per cent removed Settled effluent from trickling filter as discharged to Nashua River.	5 29.75	— 25.01	32 4.74	3 12.15	— 9.73	26 2.42	72 .51	45 .22	46 .14	43 .08	— 4.28	— 1.2575	52 1.62	57 .92	43 .40	— —	— —			
Per cent removed by secondary settling tanks.	.2	3	—	.2	2	—	9	15	0	33	2	—	3	9	15	—	Period of sedimentation about 6 hours.			
Per cent removed by trickling filter and secondary tanks.	5	2	21	4	—	21	74	53	46	62	.7	—	53	61	52	—	Tanks cleaned 6 times.			

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc. — Continued.*
 [PARTS IN 100,000.]
Milford.

	RESIDUE ON EVAPORATION						AMMONIA.						NITROGEN AS—				OXYGEN CONSUMED.			Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.			Nitrates.	Nitrites.	Unfiltered.	Filtered.	Kjeldahl Nitrogen.						
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.															
Imhoff tank effluent as applied to trickling filter.	29.02	25.90	3.12	9.82	7.38	2.44	2.44	.41	.23	.18	4.43	—	—	2.13	1.34	.63	—	Trickling filter has an area of .28 of an acre and a depth of 6 feet of stone from 1 to 1½ inches in size.			
Effluent from trickling filter.	34.71	29.81	4.90	13.03	10.48	2.55	.75	.21	.13	.08	4.86	1.5502	.0127	1.54	.80	.45	—				
Per cent removed	—	—	—	—	—	—	69	49	43	56	—	—	—	28	40	29	—				
Settled effluent from trickling filter as discharged to Charles River.	34.78	32.07	2.71	13.45	11.25	2.20	.44	.20	.13	.07	5.01	1.5712	.0183	1.38	.69	.37	—				
Per cent removed by secondary settling tank.	—	—	45	—	—	14	41	5	0	13	—	—	—	10	14	18	—				
Per cent removed by trickling filter and secondary tank.	—	—	13	—	—	10	82	51	43	61	—	—	—	35	48	41	—				

TABLE NO. 4.—Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per cent Removed, etc.—Concluded.

[Parts in 100,000.]
Worcester.

	RESIDUE ON EVAPORATION.						AMMONIA.			Chlorine.		NITROGEN AS—		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.		Nitrates.	Nitrites.	Unfiltered.	Filtered.					
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.												
Imhoff tank effluent as applied to trickling filters.	64.27	49.62	14.65	16.87	8.82	8.05	2.16	.54	.23	.31	8.98	—	5.22	2.17	.93	—	Trickling filters have an area of 13.68 acres and a depth of 10 feet of stone from 1¼ to 3 inches in size.	
Effluent from trickling filters.	58.78	47.69	11.09	12.31	7.36	4.95	1.73	.30	.16	.14	8.73	.2599	2.80	1.20	.63	—	The average rate of operation was about 1,700,000 gallons per acre per day.	
Per cent removed	9	4	24	27	16	39	20	44	30	55	3	—	46	45	32	—		
Settled effluent from trickling filters as discharged to Blackstone River.	55.62	46.89	8.73	10.16	6.73	3.43	1.62	.23	.14	.09	8.67	.3839	2.29	1.13	.53	—		
Per cent removed by secondary settling tanks.	5	2	21	17	9	31	6	23	13	36	.7	—	18	6	16	—	Period of sedimentation averaged about 22 hours.	
Per cent removed by trickling filters and secondary tanks.	13	6	40	40	24	57	25	57	39	71	3	—	56	48	43	—	Tank cleaned 3 times.	

TABLE NO. 5. — *Average Results of Analyses of Monthly Samples of Effluent from Sand Filters.*

[Parts in 100,000.]

CITY OR TOWN.	Free Ammonia.	Total Albuminoid Ammonia.	Chlorine.	NITROGEN AS —		Iron.
				Nitrates.	Nitrites.	
ATTLEBORO ¹	.63	.0927	4.18	.7685	.0190	.056
BROCKTON ²	1.61	.1048	6.10	2.0058	.0115	.448
Clinton ²	2.27	.1624	4.62	.0974	.0029	2.488
Concord ¹	.19	.0298	2.82	1.3142	.0088	.024
Easthampton ¹	.80	.0930	3.24	1.4735	.0191	.151
Framingham ² (Imhoff)	2.09	.1500	5.76	.7643	.0177	.773
Framingham (Direct)	3.28	.1584	5.87	.1749	.0131	1.445
Franklin	1.04	.1018	3.95	.3688	.0060	.540
GARDNER (Gardner Area) ³	2.32	.1535	6.65	1.1845	.0137	.589
GARDNER (Templeton Area) ²	3.60	.2125	5.46	.4054	.0120	1.068
Hopedale ²	1.13	.0924	3.99	2.6314	.0016	.023
Hudson	1.22	.1400	4.58	1.2368	.0118	.304
Leicester ³	.37	.0570	2.68	.4733	.0246	.117
Marion ¹	1.03	.0780	2.85	.0835	.0023	.633
MARLBOROUGH ²	1.01	.0983	5.50	1.0709	.0101	.294
Milford	2.15	.1489	5.65	.1602	.0023	1.190
Natick	2.86	.1288	6.88	.0631	.0003	.918
North Attleborough ¹	.38	.0573	2.55	.2608	.0050	.141
Northbridge ¹	1.06	.1072	2.21	.2461	.0041	1.153
Norwood ²	1.21	.0964	9.64	.3139	.0107	.383
PITTSFIELD ²	1.65	.2294	4.45	.1816	.0230	.297
Southbridge ²	3.31	.1545	5.44	.0466	.0006	1.067
Spencer ¹	.45	.0713	3.55	.4710	.0167	.247
Stockbridge ²	.18	.0614	1.49	.6901	.0145	.113
Westborough ²	1.37	.1291	6.17	.1068	.0063	.887

¹ Six samples.² Regular samples from two or more underdrains in one average.³ Four samples.TABLE NO. 6. — *Efficiency of Sand Filters. (Per Cent of Free and Albuminoid Ammonia removed.)*

[Parts in 100,000.]

CITY OR TOWN.	FREE AMMONIA.			TOTAL ALBUMINOID AMMONIA			CHLORINE		Rate of Operation with Even Distribution (Gallons per Acre per Day). ¹
	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	
ATTLEBORO	2.53	.63	75	.65	.0927	86	3.78	4.18	64,000
BROCKTON	3.18	1.61	49	.55	.1048	81	5.76	6.10	56,000
Clinton	2.56	2.27	11	.93	.1624	83	4.85	4.62	60,000
Concord	2.59	.19	93	.72	.0298	96	3.53	2.82	94,000
Easthampton	2.67	.80	70	.71	.0930	87	4.07	3.24	—
Framingham (Imhoff)	3.67	2.09	43	.75	.1500	80	5.48	5.76	48,000
Framingham (Direct)	4.07	3.28	19	1.82	.1584	91	6.14	5.87	
Franklin	3.07	1.04	66	.55	.1018	81	6.57	3.95	82,000
GARDNER (Gardner Area)	6.58	2.32	65	1.13	.1535	86	5.70	6.65	104,000
GARDNER (Templeton Area)	3.18	3.60	—	.60	.2125	65	4.39	5.46	
Hopedale	4.82	1.13	77	.70	.0924	87	4.20	3.99	53,000
Hudson	3.92	1.22	69	.70	.1400	80	4.90	4.58	71,000
Leicester	1.51	.37	75	.52	.0570	89	2.25	2.68	—
Marion	2.56	1.03	60	.88	.0780	91	4.80	2.85	94,000
MARLBOROUGH	3.52	1.01	71	.82	.0983	88	7.78	5.50	61,000
Milford	2.61	2.15	18	.50	.1489	70	5.13	5.65	50,000
Natick	3.18	2.86	10	.79	.1288	84	7.49	6.88	61,000
North Attleborough	1.54	.38	75	.45	.0573	87	3.30	2.55	109,000
Northbridge	2.15	1.06	51	.46	.1072	77	2.43	2.21	56,000
Norwood	2.69	1.21	55	.78	.0964	88	13.69	9.64	78,000
PITTSFIELD	2.55	1.65	35	.67	.2294	66	5.35	4.45	89,000
Southbridge	3.73	3.31	11	.77	.1545	80	5.40	5.44	83,000
Spencer	2.83	.45	84	2.04	.0713	97	4.10	3.55	—
Stockbridge	1.71	.18	89	.36	.0614	83	1.70	1.49	—
Westborough	3.02	1.37	55	1.16	.1291	89	15.03	6.17	57,000

¹ See also Table No. 7.

TABLE No. 7. — *Extent of Sewerage Works, Rate of Flow, and Rate of Operation of Sand Filters.*

CITY OR TOWN.	Popu- lation, Census of 1925.	Approxi- mate Length of Sanitary Sewers (Miles).	Approxi- mate Number of House Con- nections.	ESTIMATED QUANTITY OF SEWAGE TREATED (GALLONS PER DAY).			Estimated Average Quantity of Sewage per Connection.	Net Area of Filter Beds.	Estimated Rate of Operation with Even Dis- tribution (Gallons per Acre per Day).
				Average for Year.	Average for Month of Maximum Flow.	Average for Month of Minimum Flow.			
ATTLEBORO .	20,623	35.69	1,566	994,000	1,395,000	643,000	635	15.50	64,000
BROCKTON .	65,343	98.67	8,253	3,595,000 ¹	4,936,000	2,578,000	436	27.00	56,000
CLINTON .	14,180	24.69	1,859	1,563,000 ²	2,039,000	1,076,000	841	26.23	60,000
CONCORD .	7,056	8.98	808	401,000	694,000	271,000	790	4.28	94,000
EASTHAMPTON .	11,387	20.87	1,151	—	—	—	—	2.20	—
FITCHBURG .	43,609	—	—	3,788,000	5,263,000	2,647,000	—	—	—
FRAMINGHAM .	21,078	38.30	3,134	1,388,000	1,720,000	893,000	443	29.12	48,000
FRANKLIN .	7,055	14.20	787	267,000	371,000	138,000	339	3.24	82,000
GARDNER .	18,730	33.70	2,363	1,304,000	2,000,000	1,125,000	552	12.50	104,000
HOPEDALE .	3,165	7.00	367	200,000 ³	236,000	175,000	545	3.79	53,000
HUDSON .	8,130	13.90	1,051	641,000	855,000	489,000	610	9.00	71,000
MARION .	1,271	3.93	189	108,000	128,000	88,000	571	1.15	94,000
MARLBOROUGH .	16,236	35.66	2,576	1,265,000	2,140,000	562,000	491	20.90	61,000
MILFORD .	14,781	22.00	1,663	464,000 ⁴	577,000	341,000	279	9.30	50,000
NATICK .	12,871	12.81	1,546	774,000	941,000	731,000	500	12.60	61,000
NORTH ATTLEBOROUGH .	9,790	17.23	880	766,000	877,000	637,000	870	7.00	109,000
NORTHBRIDGE .	10,051	—	—	671,000	746,000	365,000	—	12.00	56,000
NORWOOD .	14,151	24.33	1,797	1,132,000	1,703,000	776,000	630	14.47	78,000
PITTSFIELD .	46,877	70.29	6,021	3,656,000	4,742,000	1,897,000	607	41.15	89,000
SOUTHBURGE .	15,489	—	—	1,039,000	1,110,000	988,000	—	12.50	83,000
WESTBOROUGH .	6,348	7.97	514	333,000	542,000	218,000	648	5.80	57,000
WORCESTER .	192,242	294.70 ⁵	—	21,100,000	47,290,000	12,480,000	—	—	—

¹ Includes an average of 2,074,000 gallons per day to trickling filter and 1,521,000 gallons to sand filters (27 acres)² New development not included in average.³ Records questionable. Amount treated by sand filters only.⁴ Entire quantity of sewage not treated.⁵ Includes 70 miles of combined sewers.

TABLE No. 8. — *General Features.*

CITY OR TOWN.	Year of Construction of and Additions to Works.	Depth of Under-drains (Feet).	Distance of Apart of Under-drains (Feet).	Filtering Material.	Attention given to Disposal Works.
ATTLEBORO.	1912, 1913	4-7	35	Excellent sand and gravel; found in place	One man all the time; others when necessary.
BROCKTON.	1893, 1905, 1908, 1912	5.5	30	Good sand and gravel; found in place	One chemist in charge, foreman, day and night man, more when necessary.
Clinton	1898, 1899	8	60-70	Good sand and gravel; found in place	Two men all the time; others when necessary.
Concord	1899	none	—	Good sand underlain with gravel; found in place	One man once a day.
Easthampton	1908	3.5	20-40	Good sand and gravel; largely found in place	One man all the time; others when necessary.
FITCHBURG.	1914	—	—	Trickling filter — 10 feet deep	Chemist in charge; 1 foreman, 1 day and 2 night men.
Framingham	1890, 1924	—	—	Good sand and gravel	One man all the time; others when necessary.
Franklin	1915	4.5	26	Good sand and gravel	Very little attention; one man once in a while.
GARDNER (Gardner Area)	1891	5	20	Good sand; handled in construction	One man all the time; others when necessary.
GARDNER (Templeton Area)	1901, 1909	3-4	20-30	Coarse sand; handled in construction	One man all the time; others when necessary.
Hopedale	1900, 1923	3	35-60	Good material—sand and gravel	One man all the time; others when necessary.
Hudson	1904, 1910	5-6	50-100	Good sand and gravel; found in place	One man all the time; others when necessary.
Leicester	1894	4	8	Hard, compact sand; found in place	Very little attention.
Marion	1906	5	—	Mostly good sand; pockets of fine sand and some ledge; largely found in place	One man every day in summer, every other day in winter.
MARLBOROUGH	1891, 1908, 1909, 1910, 1911, 1907, 1924	4.5-6	30-50	Rather fine sand; found in place	One man all the time; others when necessary.
Milford	1896	5	40	Rather fine sand; found in place; trickling filter	One man every day; others when necessary.
Natick	1909, 1910	6	36	Sand of good quality, but stratified; found in place	One man all the time; others when necessary.
North Attleborough	1906, 1907, 1920	5-6.5	55	Coarse sand and gravel; found in place	One man every day; others when necessary.
Northbridge	1909, 1918, 1923, 1924	4	50-75	Coarse sand and gravel; mostly handled	Two men all the time; others when necessary.
Norwood	1923, 1924	4-6	40	Good sand and gravel; partly handled	One man all the time; others when necessary.
Pittsfield	1901, 1915	4	35	Good sand; mostly found in place	Two men all the time; others when necessary.
Southbridge	1908	4	40	Fair sand and gravel; considerable quantity handled, some found in place.	Two men part of every day.
Spencer	1925, 1926, 1897, 1923	¹	—	Good sand and gravel; largely found in place	One man all the time; others when necessary.
Stockbridge	1899, 1921, 1922	{ 3-4.5 3-4.5	23 30	Sand filters, good quality sand	One man all the time.
Westborough	1892, 1911	5	30-40	Irrigation area, rather fine sand	One man all the time; others when necessary.
WORCESTER	1898 ² , 1925	4-6	35-50	Good sand and gravel; handled in construction	Chemist in charge; several men all the time.
				Trickling filters, sand area not in use	

¹ Only three beds underdrained.² Year of first construction of sand filters.

Many additions.

³ Sedimentation tanks and sand beds abandoned June, 1925. Imhoff tanks, trickling filters and secondary tanks installed.

EXAMINATION OF SEWER OUTLETS DISCHARGING INTO THE SEA.

At the end of the year the new outfall sewer of the city of Lynn designed to discharge the sewage of that city into the sea off the mouth of Lynn harbor was completed and the pumping station and pumping equipment were nearly ready for operation. The new outfall sewers at Marblehead and Gloucester were also approaching completion at the end of the year, and much of the work had been completed in the construction of the outlet for the sewage of the South Essex Sewerage District, which comprises the cities of Salem, Peabody and Beverly and the town of Danvers and certain public institutions in Danvers and Middleton.

WATER SUPPLY OF MUNICIPALITIES IN THE COUNTY OF ESSEX AND IN ADJACENT PORTIONS OF THE COUNTY OF MIDDLESEX.

In accordance with the requirements of Chapter 30 of the Resolves of the year 1927, the Department completed during the year the investigation of water supply needs and resources for the municipalities of the County of Essex and adjacent portions of the County of Middlesex. These reports were submitted to the Legislature on November 29 and December 13, 1927, and were printed as House Documents 301 and 302 of the year 1928, the former relating to municipalities in the southern part of Essex County and the latter to municipalities in the Merrimack River valley. The reports recommended plans for meeting the water supply requirements of the municipalities included in the resolve.

NEPONSET VALLEY SEWER.

Under the provisions of Chapter 43 of the Resolves of 1926, the Department presented to the Legislature of 1927 a report recommending the extension of the South Metropolitan Sewerage System to serve 7 towns in whole or in part in the upper part of the valley of the Neponset River. This report was printed as House Document 212 of the year 1927 and was referred by the Legislature to the session of 1928.

WATER SUPPLY AND SEWERAGE OF STATE SANATORIA.

Plans were prepared during the year and proposals invited for the construction of sewage disposal works for the Lakeville Sanatorium, but it was found that the appropriation available was inadequate for the construction of a proper system of sewage disposal for that institution and all bids were rejected.

A contract was let during the year for the reconstruction and improvement of part of the sewage disposal works at the North Reading Sanatorium and the work was completed before the end of the year.

Further investigations were made with reference to the disposal of sewage and the construction of a swimming pool at the Westfield Sanatorium.

USE OF WATER FROM CHARLES RIVER BASIN FOR INDUSTRIAL PURPOSES.

An investigation was made during the year in conjunction with the Metropolitan District Commission, under the provisions of Chapter 42 of the Resolves of 1927, relative to the use of water from the Charles River Basin for industrial purposes. A report based upon this investigation was presented to the Legislature of 1928 and printed as House Document 73 of that year.

SEWERAGE FOR THE NEW METROPOLITAN STATE HOSPITAL IN WALTHAM, BELMONT AND LEXINGTON.

An investigation was made by the Division in connection with the Department of Mental Diseases and the Metropolitan District Commission relative to the disposal of sewage from the proposed Metropolitan Hospital in Waltham, Belmont and Lexington, the results of which were presented in a report to the Legislature of 1928, printed as House Document 261.

INVESTIGATIONS RELATING TO SHELLFISH.

An investigation was made during the year by the Division, in co-operation with the Department of Conservation, with reference to the practicability of transplanting shellfish and of rendering shellfish taken from contaminated areas safe for use as food by the use of a disinfectant. The results of this investigation were presented to the Legislature of 1928 and printed as House Document 252 of that year.

GREAT FRESHET OF NOVEMBER 3-4, 1927.

Following the great freshet of November 3-4, 1927, the Division rendered whatever assistance was practicable in determining the condition of water supplies in the area affected, advising as to means of preventing danger to the public health therefrom.

REPORT OF THE DIVISION OF WATER AND SEWAGE LABORATORIES.

H. W. CLARK, *Director.*

This Division, consisting of laboratories in the State House and the Lawrence Experiment Station, accomplished more analytical work during 1927 than in any previous year. Much necessary research work was also carried on, all of this analytical and research work being necessary in connection with the general oversight of the Department of the inland waters of the State, such as rivers, water supplies, etc., the disposal of sewage and industrial wastes, the condition of shellfish areas and many other problems constantly occurring in the sanitary work of this Department, and necessary to adequately answer the many requests for advice from cities, towns, corporations, etc. Several special investigations concerning important water supply and sewerage problems of groups of cities and towns ordered by the Legislature also necessitated much analytical and research work, including field work. Among the special investigations by this Division can be mentioned one concerning the purification of clams from polluted areas by chlorine treatment, a summary of which is given in this report.

At the Experiment Station of this Division, where a large amount of research work is carried on, various filters, tanks, etc., for the study of methods of sewage disposal, water purification, etc., were in operation and as usual a large number of engineers, biologists, chemists, health officials, etc., visited the State House laboratories and the Experiment Station during the year and classes of students from different technical schools were instructed concerning this class of research, laboratory and public health work. The results of all the chemical analyses of water supplies, rivers, sewage applied to and effluents from municipal sewage disposal areas, etc., made by this Division are summarized in the report of the Division of Sanitary Engineering.

The following table summarizes the analytical work of this Division and a résumé of some of its research work is given on subsequent pages:

State House Laboratories.

Samples from public water supplies:	
Surface waters	2,545
Ground waters	1,257
Samples from domestic wells, ice supplies, etc.	658
Samples from rivers	1,405
Samples in connection with special Metropolitan water supply investigation	898
Samples from sewage disposal works:	
Sewages	475
Effluents	603
Samples of wastes and effluents from factories	77
Miscellaneous samples (partial analyses)	97
Microscopical examinations	3,387
Special examinations of water (including field work) for manganese, lead, copper, alkalinity and acidity, fats, dissolved oxygen and carbonic acid	2,087

Lawrence Experiment Station.

Chemical examinations on account of investigations concerning the disposal of domestic sewage and factory wastes, filtration and other treatment of water supplies, swimming pools, and the investigation of the Merrimack and other rivers	2,359
Mechanical and chemical examinations of sands	182
Bacterial examinations of water supplies, rivers, sewage filter effluents, ice, swimming pools, wastes, etc.	4,593
Bacterial examinations in connection with methods of purification of sewage and water.	837
Bacterial examination of shellfish and sea waters	1,519

CHARACTER OF THE SEWAGE USED FOR INVESTIGATIONS UPON SEWAGE PURIFICATION AT THE LAWRENCE EXPERIMENT STATION.

The following tables present the average analyses of sewage used during the year. "Regular sewage" is the average of the sewage as pumped to the Station; "settled sewage" is the sewage applied to all tanks and filters except Filters Nos. 1, 4 and 9A, and is regular sewage after passing through Imhoff tanks and receiving a slight additional settling in a large tank supplying the various filters.

Average Analyses.

Regular Sewage.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen Consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
4.12	.80	.45	1.34	.83	9.3	5.94	1,064,000
<i>Settled Sewage.</i>							
4.09	.72	.44	1.20	.74	8.4	4.26	1,910,000
<i>Sewage applied to Filters Nos. 1, 4 and 9A.</i>							
4.28	.62	.47	1.06	.79	9.4	4.78	2,179,000

Average Solids.

Regular Sewage.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
73.6	39.6	34.0	48.9	24.3	24.6	24.7	15.3	9.4
<i>Settled Sewage.</i>								
56.0	27.9	28.1	40.1	19.1	21.0	15.9	8.8	7.1
<i>Sewage applied to Filters Nos. 1, 4 and 9A.</i>								
56.3	25.7	30.6	43.3	20.0	23.3	13.0	5.7	7.3

SLUDGE DIGESTION.

Imhoff and Separate Sludge Digestion Tanks.

Since the advent of colorimetric pH, or hydrogen ion concentration control, there has been much study of its application to sewage sludge digestion in Imhoff tanks. Notable work has been done in this respect by Rudolphins at the New Jersey Sewage Experiment Station, by Fair and Carlson and also by Baity at Harvard, and it appears to be the consensus of opinion of these workers that a pH of over 7.0 and up to 7.6 is most favorable for digestion. Some believe that the use of finely divided calcium carbonate is the best means of increasing the pH. Rudolphins* states that slightly acid or very alkaline conditions are unfavorable to sludge digestion. In fact, this is generally agreed upon. Fair† found normal digestion to proceed in four stages: (1) Dominant acid fermentation; (2) temporary rise in gasification; (3) depressed gasification; (4) active methane fermentation; and all of them characterized by changes in reaction.

It is doubtful whether these stages would be followed by all sewage sludge under regular operating conditions and, in fact, nothing of this sort has been noted in the operation of Imhoff tanks at the Station or in laboratory experiments to be described later. In other words, we did not find dominant acid fermentation or depressed gasification or active methane fermentation at any particular period; that is, the volume of total gas formed was more or less constant, as was the formation of methane, and what variation there was in this respect was irregular from

*Proceedings, 11th Annual Meeting New Jersey Sewage Works Association.

†Jour. Boston Society of Civil Engineers, Feb., 1927.

the beginning of the experiments. Neither has any real acidity, other than that due to carbon dioxide, been noted in Lawrence sewage or in digesting sludge. The pH of this Lawrence sewage has ranged between 6.0 and 7.0.

The following observations in regard to pH in sludge digestion can be made: Admitting that pH 7.0 represents neutrality and lower numerical values represent acidity and higher ones alkalinity, the nature of the substances causing the changes from neutrality must be considered. Fair states in work previously noted that he has treated hydrogen ion concentration "as an entity in itself and as a factor of the biological environment as significant as that of temperature. Considered as such, it makes no difference whether its value is determined by the carbon dioxide, organic acids, bicarbonates or the net results of all these substances." Yet elsewhere he states that "reaction adjustments are not beneficial unless accomplished by the use of suitable chemicals. Soda ash and caustic soda retard the progress of digestion." It is reasonable, however, to suppose that a pH of, say, 6.2, due to an organic acid or a mineral acid, might affect digestion differently than would the same pH due to free carbon dioxide alone.

In January, 1927, a number of laboratory digestion experiments were started to study the effect of pH on the beginning of fermentation of sludge and on the rapidity, volume and composition of gases produced. Gallon bottles were fitted with rubber stoppers through which had been passed three glass tubes. The first tube extended to just above the level of the sludge placed in the bottle later and was attached to a funnel at the upper end; the second tube reached about halfway down the bottle and the portion outside the bottle was so bent as to deliver sewage to a beaker placed beside the bottle; the third glass tube was closed at the upper end with a rubber tube and pinch cock, and was used to deliver gas accumulating in the bottle. A known amount of sludge was placed in each bottle and the bottle filled with sewage. As gas was formed its accumulation forced an equivalent amount of sewage out of the second tube. Two hundred cubic centimeters of sewage were added daily to each bottle, partly to gradually remove the products of digestion and partly to furnish samples for analysis. As sewage was poured into the funnel and delivered just above the surface of the sludge, an equivalent volume ran out through the second tube from midway in the sludge bottle, or if the second tube was closed and the third opened, gas could be forced out of the top of the bottle. If the volume of gas produced was large, part of the displaced sewage was poured back and used to force out a measured volume of gas. Throughout these experiments it has been assumed that the pH of the liquid over the sludge was the same as that of the sludge itself. The pH of the sludge must be the pH of the 95 to 98 per cent or so of the liquid which is in intimate contact with the solid matter of the sludge. Dissolved carbon dioxide was determined in the sewage applied to and in the effluents from the bottles, and with analysis of the gases evolved, a complete record of the carbon dioxide formed from the sludge was obtained. The bottles, with one exception, were kept at laboratory temperature which was fairly low during the night, especially in January and February; the average temperature in the late afternoon was 70° F., and at 9.00 o'clock in the morning, 54° F. Hence the temperature conditions were not ideal but as all bottles were at the same temperature, the results are comparative. As was to be expected, most of the gas was formed at the higher temperatures.

At the beginning of the experiments a liter of sludge, collected from the Station settling tank and probably not over three days old, was placed in each bottle. The dry portion of this sludge contained 73.5 per cent volatile matter. Bottle No. 1 was run as a control; the pH of No. 2 was adjusted by addition of small amounts of precipitated calcium carbonate; small amounts of acetic acid were added daily to No. 3 to keep the pH around 6.0; the sewage applied to No. 4 was kept for twenty-four hours with occasional shaking in a bottle containing precipitated calcium carbonate. This was to imitate a sewage from a community with a very hard water supply. The sewage applied to No. 5 contained the equivalent of 1 per cent strong wool-scourings; and No. 6, 1 per cent of strong sulphite paper mill waste. Sodium nitrate, equivalent to 2.5 parts in 100,000 of nitrogen, was added to the sewage applied to No. 7. One liter of the effluent of a sand filter receiving sewage was applied to bottle No. 8 instead of the 200 cubic

centimeters of sewage the others received. The addition of nitrates and sewage filter effluent to bottles Nos. 7 and 8 was made to check up some work done at Lawrence during 1916 to 1919, inclusive, and described in the reports of those years, in which sludge was digested in tanks with the addition of the well nitrified effluent of sewage filters. This filter effluent treatment rendered the sludge inoffensive in about four weeks. Bottle No. 9 was a duplicate of No. 1 except that it was kept at an average temperature of 50° F.

Gas analyses were made every two weeks and as it was the practice to allow about a liter of gas to accumulate in the bottles before wasting any, the analyses represented closely the total gas produced in the two weeks preceding these analyses. After each analysis all the gas was forced out of the sludge bottles by the addition of sewage. It would require too much space to give all the results of each gas analysis, hence only the volume of carbon dioxide and methane produced, expressed in liters per kilogram of organic matter, is shown in following tables. The per cent of carbon dioxide in the gas from each sludge bottle was fairly constant during the four months that most of them were operated. So far as we could determine there were no progressive stages of digestion similar to those mentioned by Fair. The variations in the per cent of methane formed from week to week were irregular and apparently of no significance. Fermentation began immediately in all of the bottles and the rate of production of total gas is shown in a following table in which the dissolved carbon dioxide is calculated and included. Frequently this carbon dioxide in solution was as great as that accumulating in the gas above the liquid.

Summary.

The uncontrolled sludge bottle, the average pH of which was 6.5, produced more gas and at a higher rate from the start than did the bottle the pH of which was controlled by calcium carbonate and averaged 7.0. The sludge bottle to which acetic acid was added, giving an average pH of 6.0, gave the largest volume of gas and the largest volume of methane. The sludge bottle receiving the hard sewage practically completed fermentation in fourteen weeks, the shortest time of any except the sludge bottles receiving nitrates. When the daily evolution of gas dropped to around one-half of one per cent of the total volume evolved during the period of experiment, fermentation was considered to be complete. As far as these particular experiments go, pH control was of no appreciable value in aiding digestion. The acetic acid in bottle No. 3 by which pH was lowered was beneficial rather than otherwise and it is difficult to see why any organic acids resulting from the decomposition of sludge should act differently.

The sludge bottle receiving hard sewage was more efficient in sludge digestion and gas production than the sludge bottle to which calcium carbonate was added. The sludge bottles receiving nitrates completed fermentation in the shortest time and their gases contained a much larger proportion of nitrogen, presumably from the nitrates, than did the gas from other sludge bottles. Carbon dioxide was low in the gas from these bottles because the base of the nitrates, after their decomposition, is left as sodium oxide which combines with the free carbon dioxide. Sludge bottle No. 7, which received sodium nitrate, showed the greatest sludge destruction and unexpectedly the uncontrolled sludge bottle No. 9, kept at a low temperature, had the second greatest; sludge bottle No. 8, which received the nitrified sewage filter effluent, had the third greatest; No. 2 showed an apparent slight destruction, this being due to the accumulation of the added lime. Sludge destruction figures did not follow the volumes of gas produced, hence too much weight should not be given them; and this is also true because of the difficulty of accurate sampling. There was no "foaming" in any of the sludge bottles.

It is not believed of course, merely because the results of these bottle experiments are opposed to digestion data obtained elsewhere, that these other data are incorrect; but they do emphasize the possibility that sludge at different sewage disposal plants may not necessarily follow the same course of fermentation and digestion, and this of course has been noted.

Besides these experiments some others may be mentioned briefly: In a bottle containing the same amount of sludge and receiving distilled water the pH of which was raised to around 7.2 by shaking with calcium carbonate, no fermenta-

tion took place even after six weeks. When sodium nitrate, equivalent to 2 parts nitrogen in 100,000, was added to the distilled water, a slight fermentation — 20 to 50 cubic centimeters of gas daily — then began but ceased as soon as the addition of nitrate was stopped. In a bottle containing ripened sludge from Imhoff tank No. 545 at the Station and receiving distilled water instead of sewage for eight days, then followed by regular addition of sewage for a month, no fermentation occurred. In both of these instances, it would seem as though something in the nature of an enzyme had been removed by the water or else the liquid portion of the sludge rich in dissolved organic matter was necessary for bacterial activity. It seems hardly possible that all of the bacteria favorable to fermentation could have been washed out by the addition of the distilled water. There was some slight bacterial activity as there was always 2.0 or more parts in 100,000 of dissolved carbon dioxide present. This phase of sludge fermentation might well be investigated further.

There is one point about sludge digestion which is frequently mentioned but so far as known no explanation has been published as yet. This is the fact that as sludge ripens and digestion progresses, the pH rises and experiments in this laboratory show that it is due to calcium carbonate released by the destruction of the organic matter of the sludge by gasification in much the same way as if the sludge were actually burned. The sludge used in these experiments was found on ignition to contain 1.26 per cent calcium carbonate and .56 per cent magnesium carbonate. The ash was treated with dilute acetic acid to dissolve the carbonates and without attacking the silicates, so these values represent the real ash of the organic matter and do not include any street washings. The sewage applied to the sludge bottles contained calcium, calculated as carbonate, equivalent to 3.98 parts in 100,000. The effluent from bottle No. 1 contained 9.09 parts calcium carbonate and the effluent of bottle No. 9 contained 11.5 parts calcium carbonate. These analyses are of average samples representing daily samples for about six weeks. As these bottles were operated, part of the calcium carbonate formed was washed out in the effluent. In regular Imhoff tanks, where there is less circulation, the tendency would be for the calcium carbonate to accumulate and raise the pH.

Average Results.

pH and Free CO₂ in the Sewage applied to and Effluents from Sludge Digestion Bottles.

BOTTLE NUMBER.	pH.		FREE CO ₂ (PARTS IN 100,000).	
	Applied Sewage.	Effluent.	Applied Sewage.	Effluent.
1	6.9	6.5	3.4	13.3
2	6.8	7.0	3.4	8.6
3	6.8	6.0	—	—
4	7.1	6.7	2.2	11.1
5	7.0	6.7	1.0	11.2
6	6.7	6.3	4.8	15.5
7	6.9	7.1	3.0	2.7
8	4.7	6.6	—	2.7
9	6.9	6.5	3.4	13.0

Methane Production.—Sludge Digestion Bottles.

AT THE END OF --	LITERS OF METHANE AT 760 MM. AND 0° C. PER KILOGRAM OF ORGANIC MATTER.								
	Uncon- trolled (Bottle No. 1).	Uncon- trolled* (Bottle No. 9).	pH Control by CaCO ₃ (Bottle No. 2).	pH Control by Acetic Acid (Bottle No. 3).	Hard Sewage (Bottle No. 4).	Sewage with Wool- Scourings added (Bottle No. 5).	Sewage with Paper Mill Waste added (Bottle No. 6).	Sewage with Sodium Nitrate added (Bottle No. 7).	Sewage Filter Effluent (Bottle No. 8).
2 weeks	15.4	3.8	9.6	7.6	12.0	5.6	3.8	3.1	8.9
4 weeks	44.3	9.5	30.0	29.5	37.9	18.2	15.7	4.6	9.2
6 weeks	67.0	10.8	35.7	42.9	73.5	38.2	27.7	6.8	14.5
8 weeks	77.6	20.2	36.7	51.2	122.9	56.2	44.1	7.7	18.2
10 weeks	98.0	34.3	45.5	60.5	139.5	77.2	59.9	10.8	19.6
12 weeks	117.6	48.2	51.5	82.5	147.5	87.2	78.4	13.5	—
14 weeks	138.3	59.9	54.5	113.8	153.3	95.5	105.7	14.1	—
16 weeks	153.2	82.5	59.1	148.4	—	103.8	126.7	—	—
18 weeks	160.9	—	66.8	192.6	—	114.9	152.9	—	—
20 weeks	170.1	—	79.2	235.5	—	—	—	—	—

* Kept at 50° F.

Carbon Dioxide Production. — Sludge Digestion Bottles.

AT THE END OF —	LITERS OF CARBON DIOXIDE AT 760 MM. AND 0° C. PER KILOGRAM OF ORGANIC MATTER.			
	Uncontrolled (Bottle No. 1).	Hard Sewage (Bottle No. 4).	Sewage with Wool- Scourings added (Bottle No. 5).	Sewage with Mill Waste added (Bottle No. 6).
2 weeks . . .	4.6	4.8	2.9	2.4
4 weeks . . .	12.4	13.5	10.6	10.6
6 weeks . . .	20.2	22.5	18.1	18.6
8 weeks . . .	26.6	42.1	24.4	25.0
10 weeks . . .	32.9	47.4	30.3	31.2
12 weeks . . .	37.9	50.7	35.2	40.8
14 weeks . . .	43.6	53.8	37.2	48.6
16 weeks . . .	48.7	—	42.4	56.1
18 weeks . . .	53.7	—	48.2	68.4
20 weeks . . .	58.6	—	—	—

Total Gas Production. — Sludge Digestion Bottles.

AT THE END OF —	CUBIC CENTIMETERS OF TOTAL GAS AT 760 MM. AND 0° C.								
	Uncon- trolled (Bottle No. 1).	Uncon- trolled* (Bottle No. 9).	pH Control by CaCO ₃ (Bottle No. 2).	pH Control by Acetic Acid (Bottle No. 3).	Hard Sewage (Bottle No. 4).	Sewage with Wool- Scourings added (Bottle No. 5).	Sewage with Paper Mill Waste added (Bottle No. 6).	Sewage with Sodium Nitrate added (Bottle No. 7).	Sewage Filter Effluent (Bottle No. 8).
2 weeks	1,051	542	1,095	1,006	968	439	374	756	750
4 weeks	2,842	1,329	2,746	2,716	2,720	1,524	1,476	2,319	1,926
6 weeks	4,568	1,524	2,885	4,148	5,373	2,920	2,750	3,146	3,150
8 weeks	5,804	2,157	3,483	4,992	8,745	4,423	3,900	3,886	4,186
10 weeks	7,091	3,401	4,705	5,973	10,037	5,810	5,167	4,234	5,672
12 weeks	8,302	4,588	6,277	7,376	10,737	7,135	7,435	4,504	—
14 weeks	9,647	5,736	7,573	9,791	11,475	7,751	9,384	5,114	—
16 weeks	10,740	7,451	9,228	12,401	—	8,393	10,876	—	—
18 weeks	11,462	—	10,508	15,670	—	9,373	12,880	—	—
20 weeks	12,540	—	12,184	18,928	—	—	—	—	—

* Kept at 50° F.

IMHOFF TANKS.

During 1926 six tanks of the Imhoff type were put in operation and the operation of these tanks was continued during 1927. Two of these, Nos. 544 and 545, are constructed of concrete, 20 feet deep, with settling compartments 7 feet 4 inches long and with gas vents one foot square at each end of these compartments. These settling compartments have a 45° slope towards the center. The settling compartment of No. 544 has a capacity of 275 gallons and the digestion chamber of 955 gallons, while in No. 545 the conditions are reversed, the settling compartment holding 715 gallons and the digestion chamber 357 gallons. During 1927 the volume of sewage passed through each tank averaged 1,175 gallons daily, this giving a theoretical retention of 1.5 hours in Tank No. 544 and 3.75 hours in Tank No. 545. In each tank settleable solids have been removed from this sewage and accumulated in the digestion chamber at the rate of 1,007 pounds per million gallons of dry matter in Tank No. 544 and 885 pounds in Tank No. 545. The effluents from these two tanks are pumped to a storage tank for distribution to the various filters and 120 pounds of dry matter per million gallons were deposited in this storage tank during the year. Fermentation began in each tank about six weeks after they were put in operation in 1926. After three months the sludge in both tanks was practically odorless and has practically remained in this condition. The dry suspended matter in the digested sludge as drawn from the tanks has averaged about 8 per cent. Averages of these sludges and of four analyses of gases collected from April to June are shown in the following table:

SLUDGE FROM —	Nitrogen. (Per Cent.)	Fats. (Per Cent.)	Loss on Ignition. (Per Cent.)
Tank No. 544 . . .	3.18	11.8	58.1
Tank No. 545 . . .	3.22	13.8	57.8
GAS FROM —	Carbon Dioxide. (Per Cent.)	Methane. (Per Cent.)	Nitrogen. (Per Cent.)
Tank No. 544 . . .	15.3	35.7	49.0
Tank No. 545 . . .	10.7	41.0	58.3

Both tanks have been operated without any considerable foaming although considerable scum has accumulated in the gas vents and occasionally a small amount of floating matter in the settling compartments. The average temperature of the applied sewage has been 59° F., and that accumulated in the bottom of the tanks 52° F. Portions of sludge have been drawn weekly and pH, alkalinity to methyl orange and free ammonia, determined. These with similar determinations from other tanks are presented in the following table:

Sludge from Imhoff Tanks Nos. 544, 545, 546, 547, 548 and 549.

IMHOFF TANK NUMBER.	Free Ammonia.	Alkalinity to Methyl Orange.	Carbon Dioxide.	pH.
	[Parts in 100,000.]			
544	15.7	82.0	15.0	7.1
545	17.6	90.0	9.2	7.1
546	16.3	130.0	13.5	7.0
547	44.3	325.0	—	7.2
548	25.5	190.0	—	6.6
549	32.5	211.0	16.0	6.8

Four more so-called Imhoff tanks, Nos. 546 to 549, inclusive, have been operated since July, 1926. These are of galvanized iron, 14 feet deep and 20 inches in diameter. Forty-five degree cones with two 4-inch gas vents divide the tank into settling and digestion compartments of equal size. From October, 1926, to June, 1927, the pH of the sludge of No. 547 was maintained at from 7.0 to 7.3 by the addition of fine calcium carbonate, and the pH of No. 548 was kept around 6.0 by the addition of sulphuric acid and later of acetic acid. As the pH control was apparently of no value in starting fermentation, it was temporarily abandoned. Tank No. 546 was heated from December to May, maintaining an average temperature of 70° F. The average temperature of this tank for the year was 66° F. and of the other three, 58° F. One gallon of sludge from the Station sewage settling tank was applied daily to the first three tanks and two gallons to No. 549. Up to May, 1927, sewage was passed through the settling compartments at a rate to give two days' settling. During May and June, the settling was twenty-four hours and since then it has been eighteen hours. During the greater part of the year, sewage was applied through the gas vents to create a better circulation between the two compartments. For several months the sewage applied to No. 549 was applied through a pipe reaching below the surface of the sludge. On ten different occasions, five gallons of sludge were drawn from the bottom of each tank and poured into the top of the tank. The purpose of this was to wash out any products of bacterial growth which might inhibit fermentation. In March, most of the sludge from No. 549 was drawn off and replaced by stable sludge from Imhoff Tank No. 545. From May to August, six applications, or a total of 1,450 grams, of sodium nitrate were made to each tank. This started a slight fermentation and gave improvement in the sludges which, however, was only temporary.

In spite of all these changes the sludge in these tanks had not ripened and was not fermenting at the end of the year. This does not appear to have been due to low temperature, as one tank was heated, or to lack of circulation. In fact, there is no apparent reason for the poor results, especially in the light of the good results given by Tanks Nos. 544 and 545, unless the small size of these tanks tends to prevent any movement of the sludge and consequent mixing with the newly added sludge. During a period of slight fermentation, the upper sludge appeared to be in better condition than that at the bottom. Tank No. 546 received no sludge for three months and Tank No. 549 received twice the sludge the others did, so it does not seem to be a question of the proportion of sludge added, and the pH apparently was not an important factor.

Average Analyses.

Sewage applied to and Effluents from Imhoff Tanks Nos. 544, 545, 546, 547, 548 and 549.

Applied Sewage.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
4.12	.80	.45	1.34	.83	9.3	5.94	1,064,000
			<i>Effluent from Tank No. 544.</i>				
4.20	.65	.49	1.08	.83	8.8	5.37	2,193,000
			<i>Effluent from Tank No. 545.</i>				
4.36	.59	.44	1.03	.74	9.9	4.18	2,162,000
			<i>Applied Sewage.</i>				
3.77	.80	.51	1.52	.92	6.4	5.45	1,064,000
			<i>Effluent from Tank No. 546.</i>				
4.41	.46	.23	0.87	.40	7.3	3.68	610,000
			<i>Effluent from Tank No. 547.</i>				
4.19	.50	.27	0.83	.46	7.2	3.99	784,000
			<i>Effluent from Tank No. 548.</i>				
4.05	.65	.25	1.15	.42	7.2	4.88	621,000
			<i>Effluent from Tank No. 549.</i>				
4.25	.45	.25	0.79	.44	7.1	3.56	557,000

Average Solids.

Sewage applied to and Effluents from Imhoff Tanks Nos. 544, 545, 546, 547, 548 and 549.

Applied Sewage.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
73.6	39.6	34.0	48.9	24.3	24.6	24.7	15.3	9.4
			<i>Effluent from Tank No. 544.</i>					
57.6	26.5	31.1	45.7	20.3	25.4	11.9	6.2	5.7
			<i>Effluent from Tank No. 545.</i>					
54.9	24.9	30.0	40.9	19.7	21.2	14.0	5.2	8.8
			<i>Applied Sewage.</i>					
63.1	33.9	29.2	44.2	23.3	20.9	18.9	10.6	8.3
			<i>Effluent from Filter No. 546.</i>					
58.5	26.2	32.3	41.7	16.1	25.6	16.8	10.1	6.7
			<i>Effluent from Filter No. 547.</i>					
61.3	27.0	34.3	43.6	17.7	25.9	17.7	9.3	8.4
			<i>Effluent from Filter No. 548.</i>					
69.7	30.5	39.2	43.5	16.7	26.8	26.2	13.8	12.4
			<i>Effluent from Filter No. 549.</i>					
51.5	22.8	28.7	40.4	16.8	23.6	11.1	6.0	5.1

OPERATION OF HOUSEHOLD SEPTIC TANKS.

Two small septic tanks of the household type have been operated at the Station since June, 1920. These tanks are of concrete construction and are designated as Nos. 507 and 508. The first tank is 4 feet long, 2 feet wide and 40 inches deep,

with a sloping bottom and a capacity of 185 gallons; the second is constructed as the first but consists of two compartments and has a total capacity of 370 gallons. Sewage enters each tank through trapped inlets and discharges through a pipe reaching fifteen inches below the surface of the sewage in the tank. A baffle is placed one-third of the distance from the inlet to the outlet and reaches to within eight inches of the bottom of the tank. A trapped outlet is provided for the escape of gas, and air is carefully excluded. The first tank receives fresh household sewage and the second, Lawrence sewage, — a comparatively stale sewage. Both tanks are so operated that theoretically the sewage is held within each for two days. During almost the entire period of operation the effluents from both tanks have been remarkably clear and comparatively odorless, although a slight hydrogen sulphide odor has been noted in these effluents occasionally. Both tanks have been opened for observation and sludge measurements five times since 1920 and results in regard to this have been given in previous reports. When opened in August, 1927, it was found that sludge had so accumulated that nearly two-thirds of each tank was filled with sludge, which of course lessened materially the period of detention of sewage within the tank. The sludge so accumulated resembled well digested Imhoff tank sludge and was practically odorless. All of this sludge, with the exception of six inches in depth, was removed and the tanks again put in operation. It was determined that during the seven years of their operation 59 per cent of the total sludge, so called, and 73 per cent of the organic matter of this sludge entering Tank No. 507 had been destroyed or disappeared. The figures for Tank No. 508 were 53 per cent and 77 per cent, respectively. The sludge removed from Tank No. 507 in August, 1927, contained 2.09 per cent nitrogen, 12.2 per cent fats, and its loss on ignition was 40.8 per cent. The sludge from Tank No. 508 contained 2.15 per cent nitrogen, 13.0 per cent fats, and its loss on ignition was 30.2 per cent.

Average Analyses.

Fresh Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen Consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.						
	Total.	In Solution.	Total.	In Solution.			
4.94	.93	.54	1.68	.98	6.9	5.21	2,720,000
Effluent from Closed Septic Tank No. 507.							
5.00	.50	.33	0.94	.58	6.1	3.17	810,000
Regular Sewage applied to Closed Septic Tank No. 508.							
3.83	.87	.52	1.50	.97	8.6	6.09	2,200,000
Effluent from Closed Septic Tank No. 508.							
3.20	.33	.21	0.59	.40	6.5	3.22	900,000

Average Solids.

Fresh Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
72.9	41.8	31.1	44.1	21.6	22.5	28.8	20.2	8.6
<i>Effluent from Closed Septic Tank No. 507.</i>								
43.7	20.2	23.5	34.2	13.6	20.6	9.5	6.6	2.9
<i>Regular Sewage applied to Closed Septic Tank No. 508.</i>								
69.1	34.3	34.8	46.8	21.1	25.7	22.3	13.2	9.1
<i>Effluent from Closed Septic Tank No. 508.</i>								
45.0	20.4	24.6	37.5	15.5	22.0	7.5	4.9	2.6

PURIFICATION OF SEWAGE BY AERATION.

Activated Sludge Process.

Experiments on the aëration of sewage have been carried on at the Experiment Station continuously since 1912 and the results have been published in the annual reports of the Department. Activated sludge Tank No. 485, started in 1917, is still in operation. It consists of three compartments 75 inches deep, each holding 230 gallons. The overflow from the last one passes through two settling tanks of 600 gallons' and 160 gallons' capacity, allowing about seven hours' sedimentation, and the settled sludge is pumped back to the first compartment practically every hour. The tank is operated at the rate of 7,500,000 gallons per acre daily and this volume could undoubtedly be doubled in a tank of twice the depth of Tank No. 485 and with as good results and the use of no greater volume of air. As is the usual custom, about 20 per cent by volume of sludge is retained in Tank No. 485, the surplus being pumped to waste from time to time. During the year this surplus was at the rate of 1,000 pounds dry sludge per million gallons of sewage treated. The sewage applied to this tank was first passed through Imhoff tanks Nos. 544 and 545 and the main supply tank of the Station. By this preliminary treatment 1,127 pounds of dry sludge per million gallons were removed, or a total removal of sludge by the complete process of 2,127 pounds per million gallons. Filtros plates are used as air diffusers. The activated sludge examined during the year contained 6.0 per cent of nitrogen and 6.6 per cent of fats. The effluent has been clear and stable, and nitrification has been fairly good.

*Average Analyses.**Sewage applied to Activated Sludge Tank No. 485.*

[Parts in 100,000.]

APPEARANCE.		AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	NITROGEN AS —		Oxygen Consumed.	Bacteria per Cubic Centimeter.
Turbidity.	Color.	Free.	Total.	In Sol.	Total.	In Sol.		Nitrates.	Nitrites.		
—	—	4.11	.74	.44	1.26	.75	8.2	—	—	4.50	1,910,000
<i>Effluent from Activated Sludge Tank No. 485.</i>											
0.8	.67	2.22	.25	.17	0.46	.32	8.4	.40	.0281	1.44	360,000

*Average Solids.**Sewage applied to Activated Sludge Tank No. 485.*

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
57.3	26.5	30.8	41.9	16.9	25.0	15.4	9.6	5.8
<i>Effluent from Activated Sludge Tank No. 485.</i>								
39.1	12.7	26.4	35.7	10.3	25.4	3.4	2.4	1.0

SAND, TRICKLING AND CONTACT FILTERS.

During the year three sand filters, eight trickling filters and one contact filter were in operation. Two of the sand filters have now been receiving sewage for forty years and one for thirty-seven years. One trickling filter has been in operation twenty-eight years (No. 135) and the remainder for approximately fourteen years, and the contact filter for twenty-six years. Statements in regard to the operation of these filters have been given in many reports. They are now operated to show factors in regard to period of operation with minimum attention, rates of operation that can be continued year after year without clogging, comparative

rates of each class, comparative purification and, in the case of the trickling filters, results from different depths of filtering material. The average analyses for the year follow:

Average Analyses.

Effluent from Filter No. 1.

[Parts in 100,000.]

TEMPERATURE (DEGREES F.).		AMMONIA.		Chlorine.	NITROGEN AS —		Oxygen con- sumed.	Alka- linity.	Bacteria per Cubic Centimeter.
Applied.	Effluent.	Free.	Albumi- noid.		Nitrates.	Nitrites.			
59	52	.5042	.0468	7.3	3.17	.0013	.43	—3.4	9,400
<i>Effluent from Filter No. 4.</i>									
60	52	.0182	.0184	6.7	2.47	.0004	.27	—1.8	950
<i>Effluent from Filter No. 9A.</i>									
59	54	.4167	.0414	6.2	2.73	.0002	.44	—1.8	10,200

Average Analyses.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.

[Parts in 100,000.]

FILTER NUMBER.	Quantity Applied.— Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen Consumed.	Bacteria per Cubic Centimeter.
		Free.	ALBUMINOID.				Nitrates.	Nitrites.		
			Total.	In Sol.						
135	1,410,000	2.03	.49	.27	0.84	8.1	1.70	.0222	2.88	239,000
452	749,000	2.63	.61	.31	1.05	8.2	1.36	.1515	3.66	610,000
453	468,000	3.14	.54	.33	0.96	8.1	1.19	.0493	3.08	781,000
454	1,680,000	2.71	.51	.31	0.94	8.2	1.57	.1342	2.99	1,020,000
455	3,600,000	2.16	.46	.25	0.78	8.1	1.60	.0448	3.21	920,000
473	467,000	2.95	.53	.30	0.92	8.3	1.21	.0933	3.02	1,030,000
474	1,400,000	3.05	.54	.27	0.97	8.2	0.73	.0910	2.85	640,000
475	3,280,000	2.45	.55	.27	0.96	8.4	1.57	.0522	3.70	580,000

Average Solids.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.

[Parts in 100,000.]

FILTER NUMBER.	UNFILTERED.			FILTERED.			IN SUSPENSION.		
	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
135	62.0	28.9	33.1	50.2	22.9	27.3	11.8	6.0	5.8
452	60.2	26.8	33.4	43.6	18.0	25.6	16.6	8.8	7.8
453	56.2	24.8	31.4	44.0	19.0	25.0	12.2	5.8	6.4
454	59.7	26.2	33.5	46.9	20.3	26.6	12.8	5.9	6.9
455	56.8	27.3	29.5	45.6	20.1	25.5	11.2	7.2	4.0
473	55.3	23.6	31.7	44.0	18.5	25.5	11.3	5.1	6.2
474	53.3	21.7	31.6	38.6	14.5	24.1	14.7	7.2	7.5
475	64.0	30.4	33.6	47.0	21.1	25.9	17.0	9.3	7.7

Average Analyses.

Effluent from Contact Filter No. 175.

[Parts in 100,000.]

Quantity Applied— Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen Con- sumed.	Bacteria per Cubic Centi- meter.
	Free.	ALBUMINOID.				Nitrates.	Nitrites.		
		Total.	In Sol.						
308,000	1.32	.35	.22	.62	8.0	1.27	.7015	2.36	124,000

Average Solids.
Effluent from Contact Filter No. 175.
 [Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
47.9	19.2	28.7	42.0 42.	16.5	25.5	5.9	2.7	3.2

FILTRATION OF WATER.

During the year nine sand filters, loaded or impregnated with ferric or aluminum hydroxide, were operated. Filters of this type, originating at the Lawrence Experiment Station, have been operated continuously since 1917 and have been fully described in previous reports. Five of these filters, which have been operated a number of years, gave the usual satisfactory results during the year and data in regard to them are given in the following tables.

A filter (No. 560), 3 inches in diameter and containing 3 feet in depth of sand of an effective size of 0.25 millimeter and impregnated with 100 tons per acre of ferric sulphate as hydroxide, was operated for ten weeks at a rate of 5 million gallons per acre daily with colored water from deep peat Tank No. 551. The average color of the applied water was 0.65 and of the effluent 0.16.

Three more filters were operated for six months to test the feasibility of concentrating the ferric hydroxide in 2 feet in depth of sand instead of the usual 4 feet. These filters contained 100, 200 and 300 tons per acre, respectively, of ferric sulphate precipitated as hydroxide. The results showed that this concentration was not practical as the filters needed to be regenerated with sodium hydroxide much more frequently than the deeper filters with a smaller amount of ferric hydroxide per foot in depth of filter, and the color removal also was less satisfactory.

Filters, such as described above, have two great advantages over mechanical filters used for color removal from water, — (1) the use of a minimum amount of chemical and (2) no attention is required except during the period of regeneration.

Average Chemical Analyses.
 [Parts in 100,000.]

FILTER NUMBER.	Color.	AMMONIA.			NITROGEN AS —		Oxygen Consumed.	Iron.	Alka- linity.	Carbon Dioxide
		Free.	ALBUMINOID.		Nitrates.	Nitrites.				
			Total.	In Sol.						
River Water	.51	.0166	.0195	.0133	.023	.0009	.51	.0718	0.7	0.4
488	.15	.0241	.0110	—	.021	.0004	.26	.0288	1.3	0.1
494	.17	.0246	.0111	—	.021	.0001	.27	.0245	1.3	0.2
496	.12	.0213	.0066	—	.033	.0002	.17	.0260	1.0	0.2
535	.15	.0162	.0076	—	.021	.0003	.25	.0263	1.2	0.2
536	.14	.0225	.0095	—	.029	.0001	.24	.0298	1.2	0.2

Constructional Data on Color Removal Filters.

FILTER NUMBER.	Date Started.	Ferric or Aluminum Sulphate per Acre. (Tons.)	Ferric Hydroxide or Aluminum Hydroxide per Acre. (Tons.)	Depth of Sand. (Feet.)	Effective Size of Sand. (Millimeter.)
488	May 14, 1917	64.5	34.5	4	.25
494	June 7, 1918	80.5*	20.2	4	.25
496	Sept. 19, 1918	27.0	14.4	4	.25
535	Nov. 24, 1923	86.4	43.0	4	.25
536	Jan. 25, 1924	81.0	43.3	4	.25

*Aluminum Sulphate.

Data on Operation of Color Removal Filters since Beginning of Operation.

FILTER NUMBER.	AVERAGE GRAINS PER GALLON OF WATER FILTERED.		Number of Times Treated with NaOH	Average Number of Days between Treatments.	Average Color.
	Caustic Soda.	Ferric or Aluminum Sulphate.			
River Water	—	—	—	—	.40
488	.41	.056	57	54	.14
494	.41	.079	54	53	.16
496	.13	.026	14	201	.08
535	.43	.270	13	64	.12
536	.27	.190	13	91	.13

MECHANICAL FILTRATION OF WATER.

During the year Filter No. 520, a complete filter of the mechanical type, was operated at the comparatively low rate of 61 million gallons per acre daily. The physical characteristics of the effluent were satisfactory but its B. coli content was greater than the U. S. Treasury standard of two in one hundred cubic centimeters in about 22 per cent of all samples, averaging four for the year. This was, however, a reduction of the B. coli content of the river water applied of 99.89 per cent. The effluent, moreover, did not satisfy the proposed modification of the U. S. Treasury standard, which calls for an average of not more than one B. coli in one hundred cubic centimeters but allows 5 per cent of the samples tested to contain six B. coli in one hundred cubic centimeters. In every sample tested where the present limit of two B. coli in one hundred cubic centimeters was exceeded, more than six B. coli in one hundred cubic centimeters were found. These results confirm previous conclusions that the highly polluted Merrimack River water can not be satisfactorily purified by mechanical filtration alone.

Average Bacterial Analyses.

FILTER NUMBER.	BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			B. Coli in 100 cc.
	4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		
		Total.	Red.		Total.	Red.	
River Water	3,300	250	61	—	—	—	3,500
488	640	29	8	80.6	88.4	86.9	150
494	660	49	11	80.0	80.4	82.0	248
496	180	28	3	94.5	88.8	95.1	16
535	87	5	1	97.4	98.0	98.4	10
536	330	14	4	90.0	94.4	93.5	119

*Average Bacterial Analyses.**Merrimack River Water applied to Mechanical Filter No. 520.*

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			B. Coli in 100 cc.
4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		
	Total.	Red.		Total.	Red.	
3,300	250	61	—	—	—	3,500
<i>Water after Coagulation and Sedimentation applied to Mechanical Filter No. 520.</i>						
360	21	4	—	—	—	64
<i>Effluent from Mechanical Filter No. 520.</i>						
22	1	0	99.3	99.6	100	4

LAWRENCE CITY FILTERS.

As usual this report presents data in regard to the operation during the past year of the slow sand filters for the purification of the water supply of Lawrence. Lawrence has taken its water supply from the Merrimack River since 1875 and since 1893 it has been filtered. For the past ten years, moreover, chlorine has been added as an additional factor of safety. Three filters are in use. The oldest, 2.2 acres in area, is divided into three sections, one of which is covered; the second, 0.75 of an acre in area was built in 1907 and is also covered; the third filter, covered also, was completed early in 1926 and is 0.75 of an acre in area. The average volume of water filtered daily during 1927 was 5,092,313 gallons and liquid chlorine was applied at the pump-well at the average rate of 1.23 parts per million.

The following tables give bacterial and chemical analyses of the applied water, the effluents from the different filters and the mixed effluents as pumped to the distributing reservoir in the city after chlorine treatment. A study of the bacterial results shows that chlorine treatment of the effluents of these filters receiving one of the most polluted waters used as a source of water supply in this country, is absolutely necessary for the production of a safe supply.

Average Bacterial Analyses.

Merrimack River. — Intake of the Lawrence City Filter.

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 cc.
4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		.001 cc.	.01 cc.	0.1 cc.	1.0 cc.	10 cc.	
	Total.	Red.		Total.	Red.						
4,700	180	53	—	—	—	0	40	74	100	100	4,500
<i>Effluent from Lawrence City Filter (Old Filter, East Open Section).</i>											
239	6	1	95.0	96.7	98.1	—	—	—	4	32	7
<i>Effluent from Lawrence City Filter (Old Filter, East Covered Section).</i>											
207	5	1	95.6	97.3	98.1	—	—	0	10	64	15
<i>Effluent from Lawrence City Filter (Old Filter, West Open Section).</i>											
283	6	1	94.0	96.7	98.1	—	—	0	11	51	15
<i>Effluent from Lawrence City Filter (New Filter).</i>											
23	2	0	99.5	98.9	100.0	—	—	0	4	8	4
<i>Effluent from Lawrence City Filter (North Filter).</i>											
415	9	2	91.0	95.0	96.4	—	—	1	11	53	24
<i>Mixed Effluents as pumped to the Distributing Reservoir after Chlorine Treatment.</i>											
14	3	0	99.7	98.3	100.0	—	—	0	0	0	0
<i>Water from the Outlet of the Distributing Reservoir.</i>											
245	6	0	94.8	96.7	100.0	—	—	0	0	0	0
<i>Water from a Tap at Lawrence City Hall.</i>											
93	4	0	98.0	97.8	100.0	—	—	0	0	0	0
<i>Water from a Tap at the Lawrence Experiment Station.</i>											
70	7	0	98.5	96.1	100.0	—	—	0	0	4	0
<i>Water from a Tap on the High Service System.</i>											
19	3	0	99.6	98.3	100.0	—	—	0	0	1	0

Average Chemical Analyses.
Merrimack River. — Intake of the Lawrence City Filter.
[Parts in 100,000.]

Temperature (Degrees F.).	APPEARANCE.		AMMONIA.			Chlorine.	NITROGEN AS —		Oxygen Consumed.	Iron.	Soap Hardness.
	Turbidity.	Color.	Free.	ALBUMINOID.			Nitrates.	Nitrites.			
				Total.	In Sol.						
52	0.1	.48	.0172	.0228	.0174	.39	.019	.0005	.65	.0600	1.8
<i>Effluent from Lawrence City Filter (Old East Filter).</i>											
52	0.1—	.43	.0167	.0099	—	.48	.031	.0002	.44	.1167	2.2
<i>Effluent from Lawrence City Filter (New West Filter).</i>											
52	0.0	.31	.0067	.0099	—	.55	.030	.0002	.43	.0492	2.1
<i>Effluent from Lawrence City Filter (New North Filter).</i>											
52	0.0	.35	.0083	.0122	—	.45	.026	.0001	.47	.0300	1.9
<i>Water from the Outlet of the Distributing Reservoir.</i>											
52	0.0	.40	.0094	.0102	—	.57	.023	.0002	.43	.0772	2.1
<i>Water from a Tap at Lawrence City Hall.</i>											
54	0.0	.40	.0060	.0102	—	.58	.029	.0002	.40	.0785	2.1
<i>Water from a Tap at the Lawrence Experiment Station.</i>											
53	0.0	.39	.0051	.0097	—	.58	.028	.0002	.40	.0807	2.1

COLOR STUDIES.

During 1926 a study was begun in regard to the origin and characteristics of color in water and color-yielding peat, soils and other materials. This study was divided into several lines of research work and its progress during 1926 was briefly summarized on pages 44 to 48, inclusive, of the report of the Department for that year. As stated in that report, these studies were designed to show (1) the actual amount of color yielded by certain soils, peats, etc., under different conditions, both aerobic and anaerobic; (2) the relation of this color to the organic matter in each material; (3) the rapidity with which each would yield color; (4) the difference in rapidity under different conditions, such as passage of water through or simply standing in and over these materials; (5) the effect of depth of water over muck, peat, etc.; (6) the acidity or alkalinity factor by pH determinations; (7) the action of light, etc., and many other questions.

In the first place, materials from different locations and of the varying and characteristic nature of the materials often found at reservoir sites were collected for examination and experiment. These materials can be briefly described as follows:

- No. 1. Largely dead grass roots just below the live roots in a meadow.
- No. 2. Black muck from a similar meadow containing few roots or peaty matter.
- No. 3. "Old" peat thrown out during the construction of a canal through an Essex County swamp.
- No. 4. Peat from the same locality but rather "newer" than No. 3.
- No. 5. Peaty material from a salt marsh.
- No. 6. "New" peat from near the surface of a woody swamp containing roots and coarse fibrous matter.
- No. 7. Practically the same as No. 3.
- No. 8. Practically the same as No. 4, but both Nos. 7 and 8 from different localities.

The studies with deep tanks described on page 47 of the same report were continued with the addition of two other tanks, Nos. 555 and 556, respectively, which are less than half the depth in feet of Nos. 550, 551 and 552 (that is, 8 feet instead of 20) but with the same diameter as the other tanks, namely, 20 inches. In the bottom of Tank No. 555 was placed one foot in depth of sods and loam from an

uncultivated pasture of thin, gravelly soil, and in Tank No. 556, one foot of material such as leaves, bits of dead wood, pine needles, etc., collected from the upper two inches of a wooded area. The loss on ignition of these two materials was 11.6 per cent and 73.0 per cent, respectively. Hence during 1927 Tank No. 550 contained in its bottom $2\frac{1}{2}$ feet in depth of peat No. 6; Tank No. 551, $2\frac{1}{2}$ feet in depth of peat No. 3, and Tank No. 552, $2\frac{1}{2}$ feet in depth of peat No. 4 over which six inches of clean sand had been placed when the tank was first put in operation, Tanks Nos. 555 and 556 being as described above. Tanks Nos. 550, 551 and 552 were placed, as stated in the last report, in a special tank-house open at the top to the air and sun during the warm months but covered by an ample skylight during the colder weather. The new tanks, Nos. 555 and 556, were placed out of doors with about two-thirds of their depth below the surface of the ground. As little color was taken from the materials in Tanks Nos. 550, 551 and 552 during 1926, an experiment was started with No. 550 by which the temperature of the water contained in it was increased to a summer temperature of 73° F. It was apparent, as would be expected, that much more color was taken from the water under this condition, and it was also apparent that certain of this color extracted from the peat was precipitated; in other words, there was a more or less continuous process of extraction and precipitation. During this period there was no dissolved oxygen in the water of the tank. Very little color was taken from the material in Tank No. 551, to which five gallons of Merrimack River water were added daily through a pipe reaching nearly to the peat in the bottom of the tank; in fact, during the period from July 23 to November 30, 1927, there was a gradual lowering of the color of the water in this tank although it was always nearly twice as high as the color of the water in Tank No. 552 in which there was a layer of sand above the peat. The volume of water added daily was about 1.5 per cent of the capacity of the tank, which would mean theoretically over sixty-six days' storage of the water over the peat. In Tank No. 552, in which there was a layer of sand above the peat, there was little or no increase of color in the water during the year. A following table presents the figures in regard to color, dissolved oxygen and temperature of the water in these three tanks.

The most interesting fact in regard to the new shallow tanks, Nos. 555 and 556, placed in the ground, is that the color of the water in these two tanks increased from 37 in the case of No. 555 to 80, and in No. 556 to 52. The average results of color, pH, dissolved oxygen, etc., of the water in these two tanks is given in a following table. Perhaps the most interesting fact in regard to the operation of all of them is that the water in the shallow tanks became much more highly colored in six or seven months than did the water in two years in the tanks two and one-half times as deep containing material exceedingly rich in organic matter. The maximum temperature in both the deep and shallow tanks was 91° F. during the summer months. This maximum temperature was maintained for only a short time.

Experiments with Percolators containing Peat and Other Materials.

In the last report on pages 45 and 46 a discussion is given in regard to the extraction of coloring matter from peat, etc., placed in percolators. To the experiments described in that report two more percolators containing the materials used in Tanks Nos. 555 and 556 have been placed in operation. These experiments in percolators were begun partly with the idea of obtaining a measure of the amount of color that would be extracted under natural conditions from peat areas flooded for storage reservoirs and partly for other laboratory purposes.

Briefly, the method of operation consisted of placing known amounts of the various materials in the bottom of percolators having a capacity of two quarts, with mineral wool and sand as underdrains below each material and through them 100 cubic centimeters of distilled water was passed daily. In certain percolators, Nos. 1, 2, 3, etc., the water was allowed to pass through as rapidly as possible and the materials drained. In percolators 1F, 2F, 3F, etc., the materials were kept covered with water continuously. In the first percolators aerobic conditions prevailed, while in the second set, anaerobic; that is, no oxygen was present. It became evident that while this method allowed a very good estimation of the

amount of color that could be extracted from these materials under study, yet it was perhaps too slow for practical purposes, hence extraction with dilute sodium hydroxide was tried out. At first five-gram portions of the dry peats and other materials were extracted with successive portions of hot 0.5 per cent sodium hydroxide solution and made up to one gallon. This was a quick process, the chief time element being that taken in filtration, but it was feared that the treatment was too severe to give results at all comparable to those which would be obtained under natural conditions of extraction.

Following this method one was tried in which 15-gram portions of the dry materials were mixed with clean sand and 0.1 per cent of sodium hydroxide solution passed through at the rate of about a liter a day and by carrying this method on until the color extracted in a certain unit volume drops to 10 per cent of the color of the first unit volume. The time of this method can be estimated at about ten days. Results of the color extracted by the natural percolator methods and by the two sodium hydroxide methods are shown in a following table, and it is apparent that the extraction with 0.5 per cent hot sodium hydroxide solution gave results that are comparable with the slower cold 0.1 per cent sodium hydroxide solution and both are sufficiently accurate to distinguish to some extent between different types of peat and other materials so far as their color-yielding properties are concerned. These results are shown in a following table:

Total Color extracted from Peat, Soil, etc., by various Methods.

Material Number.	Organic Matter. (Per Cent.)	COLOR EXTRACTED BY .5 PER CENT HOT NaOH.		COLOR EXTRACTED BY PERCOLATING AT 70° F. WITH .1 PER CENT NaOH.		COLOR EXTRACTED BY PERCOLATING AT 70° F. WITH .1 PER CENT NaOH.*		COLOR EXTRACTED IN PERCOLATOR EXPERIMENTS WITH DISTILLED WATER.†	
		CALCULATED ON BASIS OF 5 GRAMS OF —		CALCULATED ON BASIS OF 5 GRAMS OF —		CALCULATED ON BASIS OF 5 GRAMS OF —		CALCULATED ON BASIS OF 5 GRAMS OF —	
		Material.	Organic Matter.	Material.	Organic Matter.	Material.	Organic Matter.	Material.	Organic Matter.
1	65.6	21.0	32.0	28.1	42.8	25.0	38.1	1.03	1.57
2	35.7	22.0	61.6	27.4	76.8	25.0	70.0	0.44	1.23
3	89.4	60.0	67.1	95.3	106.6	77.1	86.3	1.22	1.37
4	91.6	74.0	80.8	98.8	107.8	91.2	99.6	2.24	2.44
5	26.4	15.0	56.8	19.4	73.5	19.2	72.7	0.50	1.89
6	82.6	43.0	52.1	50.3	60.9	42.6	51.6	0.62	0.75
7	90.2	100.0	110.9	—	—	—	—	0.92	1.02
8	83.3	50.0	60.0	—	—	—	—	1.54	1.85
10	69.3	—	—	11.7	16.9	10.6	15.3	—	—
11	11.6	—	—	6.8	58.6	6.3	54.3	—	—
12	73.0	—	—	35.2	48.2	27.1	37.1	—	—

* Percolating stopped when color falls to 10 per cent of first gallon of extract.
† Full percolators, 17 months.

Average Results.
Color Tank No. 550.

COLOR.							pH.	DISSOLVED OXYGEN. (PARTS IN 100,000.)		TEMPERATURE. (DEGREES F.)	
DISTANCE FROM BOTTOM OF TANK.								Top.	Bottom.	Top.	Bottom.
2 ft.	2.5 ft.	4 ft.	6 ft.	9.5 ft.	13 ft.	16.5 ft.					
—	1.04	—	1.16	1.19	1.19	1.20	6.9	.00	.00	70	68
Color Tank No. 551.											
—	0.77	—	0.76	0.74	0.74	0.77	7.0	.17	.09	62	59
Color Tank No. 552.											
—	0.44	—	0.43	0.44	0.44	0.44	7.1	.68	.62	62	59
Color Tank No. 555.											
.48	—	.48	0.52	—	—	—	7.0	.53	.37	62	57
Color Tank No. 556.											
.37	—	.38	0.41	—	—	—	7.1	.52	.35	62	57

Substances other than Color extracted from Peat, etc.

While a study of color was the principal purpose of operating the percolators previously described, unexpected features of their operation were the amounts of mineral matter extracted from the materials treated and the nitrification occurring in the percolators operated intermittently, that is, drained daily. Nitrates as high as 0.84 part nitrogen in 100,000 were found in some average samples, and as a whole nitrification was as active after seventeen months as it was after the first few months. In all of the investigations regarding the value of peat as fertilizer, it has been found that the availability of the nitrogen is very low, hence the amount of nitrification in these percolators is rather surprising.

The effluents of the percolators resembled in every way natural, highly colored surface waters and the fact that distilled water extracted from the peats, etc., such considerable amounts of alkali and mineral matter causing hardness (probably mostly calcium and magnesium salts) shows that decaying vegetation may be the source of at least part of the mineral matter in surface waters. The material in percolator No. 12, which consisted of the surface layer of leaves, etc., from a wooded area, when flooded at the rate of about .6 of an inch in depth with distilled water daily, gave for the first six months of operation an average alkalinity to methyl orange of 8.8 parts in 100,000 and a hardness of 7.7 parts. The average alkalinity of the effluents of all these percolators when the last analyses were made after seventeen months' operation was 2.0 parts in 100,000 and the hardness was 3.8 parts. The significance of the chlorides extracted is not clear. The ash of all vegetation contains some chlorides but whether the growing organisms took the chlorine from the mineral matter of the earth or from the chlorine in rain water is not certain.

*Average Analyses.**

Effluent from Percolators containing Peat, etc.

[Parts in 100,000.]

Percolator Number.	Color.	RESIDUE ON EVAPORATION.		AMMONIA.			Chlorine.	NITROGEN AS —		Oxygen Consumed.	Iron.	Alkalinity.	Hardness
		Total.	Loss on Ignition.	Free.	ALBUMINOID.			Nitrates.	Nitrites.				
					Total.	In Sol.							
1	0.50	11.42	5.38	.0177	.0180	.0158	0.14	.469	.0017	0.72	0.04	0.5	4.0
1F	3.45	14.32	8.44	.4858	.0863	.0668	0.15	.038	.0002	2.68	1.22	4.4	4.1
2	0.12	5.34	1.61	.0128	.0103	.0077	0.11	.033	.0022	0.23	0.06	1.2	2.0
2F	3.65	14.47	5.35	.2449	.0484	.0373	0.48	.019	.0012	1.25	1.42	4.5	3.6
3	2.09	10.07	5.56	.0194	.0351	.0295	0.10	.183	.0027	1.59	0.06	1.4	3.3
3F	3.26	10.24	5.02	.1032	.0616	.0498	0.14	.018	.0002	2.25	0.49	2.7	3.6
4	3.00	13.31	7.60	.0288	.0599	.0511	0.17	.282	.0010	2.35	0.09	0.9	4.6
4F	6.60	13.58	8.10	.1153	.0863	.0757	0.12	.016	.0000	3.63	0.41	2.2	4.0
5	0.20	69.12	8.51	.0173	.0211	.0153	27.90	.081	.0019	0.26	0.04	1.0	6.1
5F	4.29	83.52	15.29	.1269	.1088	.0790	34.12	.011	.0001	2.47	1.29	6.8	7.4
6	0.46	13.73	7.45	.0058	.0238	.0192	0.18	.548	.0027	0.58	0.05	1.5	5.5
6F	1.91	10.18	4.87	.0863	.0374	.0321	0.62	.018	.0003	1.15	0.29	3.1	4.3
7F	2.33	8.99	4.83	.0243	.0356	.0303	0.15	.021	.0005	1.87	0.15	2.0	3.7
8F	3.52	10.09	5.53	.0572	.0577	.0455	0.10	.009	.0000	1.98	0.32	2.2	3.9
11F†	4.85	34.68	19.85	.7440	.2600	.1570	0.28	.016	.0000	3.21	5.40	6.4	6.1
12F†	5.10	29.83	17.05	.2964	.2500	.1120	0.20	.014	.0000	6.21	1.08	8.8	7.7

* Average for 17 months.

† Average for 6 months.

Relation between the Extractable Color and the Proportion of Organic Matter in Peat.

In a previous table are shown the amounts of color extracted from the different peats, etc., by different methods, expressed on the basis of a given weight of peat and also on the basis of the same weight of organic matter only. An examination of this table shows no relation whatever between the per cent of organic matter and the amount of color extractable with sodium hydroxide. For example, sample No. 11, with 11.6 per cent by weight of organic matter, yielded approximately the same amount of color as sample No. 12, with 73 per cent organic matter, when the colors are calculated on the basis of a given weight of organic matter. On the same basis, sample No. 1, with 65.6 per cent organic matter, yielded only about

half the color that sample No. 2 did with only 35.7 per cent organic matter. Evidently the amount of color that can be extracted from any peat or soil depends on the chemical composition of the substances making up this peat or soil, and this can not be determined by any elementary analysis such as has been tried.

Peat No. 1, which gave a low color extraction with sodium hydroxide, gave a comparatively high color in the percolator experiments. This is probably partly due to the gradual decaying, during seventeen months, of the grass roots that largely composed the sample. Peat No. 6 gave a low color by both methods. This material, while new for a peat, was apparently much more stable than No. 1 and did not decay during percolation. Analyses of the extracts from the various percolator experiments showed no relation between the color and the albuminoid ammonia, oxygen consumed and iron of these materials. No such relation would be expected when it is considered that other organic matter besides color is extracted and that the nature of this organic matter will vary with every peat.

EXPERIMENTS ON THE TREATMENT AND PURIFICATION OF CLAMS BY THE USE OF CHLORINE.

Experiments on the purification of clams from Joppa Flats (Newburyport) by chlorination were carried on under the Plum Island bridge, so called, from June 27 to August 17, inclusive, and from November 3 to November 17, inclusive. The equipment used consisted of two galvanized iron tanks, 4 feet long, 2 feet wide and 3 feet deep, and an electrically driven centrifugal pump to supply water from Plum Island River.

The method of operation was as follows: Water from the river was pumped to upper Tank No. 1 and sufficient calcium hypochlorite solution added to leave a residue in the water of about .5 part free chlorine per million after fifteen minutes. In order to accomplish this, generally from 4 to 5 parts free chlorine per million were necessary as considerable chlorine was of course consumed by the small amount of organic matter in the raw water, especially by the organic matter in suspension in this water. The clams to be treated were placed on a wire rack placed eighteen inches from the bottom of Tank No. 2. Usually one bushel of clams was treated in each experiment but one experiment was run with two bushels and two with one-half bushel each. After placing the clams on the rack the chlorinated water from Tank No. 1 was run into Tank No. 2. If necessary, more chlorine was then added to Tank No. 2 in order that there might always be a residue of .5 part free chlorine per million in the water of this tank fifteen minutes after filling. On one or two occasions, determinations of free chlorine in the water of this tank were made every half hour for eight hours after filling, and these determinations showed it was probable that some free chlorine was always present in the water of the tank for from four to six hours.

In the first two runs, or experiments, the water was allowed to stand in Tank No. 2 for twenty-four hours before being withdrawn. It was then discovered that during the warm months the dissolved oxygen was practically exhausted at the end of twenty-four hours and as this dissolved oxygen is necessary for the life of the clams, in all subsequent runs the tank was emptied and refilled with chlorinated water every twelve hours. It is, of course, impossible to state how much of the dissolved oxygen was used by the clams in breathing and how much was used by the organic matter expelled from them or how much was expelled from the water as its temperature increased while being held in the tank. It was noticeable, however, that the water in the tank lost much less oxygen during the colder weather of November than during the warmer weather of July and August. That the clams expelled considerable organic and mineral matter while under treatment of the tank was noted and there was also considerable organic matter in the water expelled by them when uncovered, that is, after water was withdrawn from the tank. Samples of this expelled water were analyzed chemically and bacterially and its organic contents and bacteria were found to be high. In all, eleven experiments were made during the period from June 27 to August 17, inclusive, and three during the period from November 3 to November 17, inclusive. Data in regard to these experiments are given in following tables.

In none of this work did we find clams with scores as high as have often been dug by us in this area during other years. The *B. coli* score of the clams dug for these experiments and collected from that portion of the flats in which they grow abundantly and from which they could probably be taken for purification, varied from 37 to 320 as shown by a following table. For one run, however, (No. 9) clams were dug only a short distance from the Newburyport sewer outlet and these had a score of 950. These latter clams were exceedingly filthy while those used in the other runs looked and smelled clean.

As a following table shows, in all the experiments with the comparatively clean clams, the score was reduced to what is considered a satisfactory point in two days' treatment and generally in one day or twenty-four hours' treatment. The badly polluted clams from near the sewer outlet, however, did not have a satisfactorily low score even after three days' treatment and it is probable that all clams in the Joppa Flats within approximately one mile of the sewer outlet are too badly polluted to be bacterially purified by this process unless much more chlorine is used than in the experiments so far carried on. Neither is it probable they are fit for consumption even if so purified. The physical condition of all the clams treated was good after one or two days' treatment and generally after three days' treatment in the tanks, and free from any odor of chlorine. In warm weather there was a gradual deterioration after three days' treatment. The lower the temperature of the water during the process of chlorination the better the condition of the clams and in a large plant the water would undoubtedly remain at a lower temperature in summer than in the small experimental tanks used in this work.

Conclusions.

The following conclusions can be drawn from this work: (1) The operation of this comparatively small apparatus has shown that clams can be satisfactorily purified by chlorine treatment for two days, or forty-eight hours, and generally in twenty-four hours, and it seems reasonable to believe that similar satisfactory results could be obtained in the operation of a large plant. (2) Bacterial reduction was as pronounced in the colder weather of November, with temperatures of the water averaging 49° F. and falling as low as 33° F., as in the warmer weather of July and August with temperatures of the water averaging 70° F. (3) The volume of water necessary per bushel of clams treated could not be absolutely determined by this experimental work. It was quite large, however, — approximately 300 gallons per bushel of clams treated. This would mean for the purification of 100 bushels daily, — approximately 30,000 gallons. The cost of pumping this volume of water in work of this sort would be negligible, however. (4) It was found, as would be expected, that the dissolved oxygen was the governing factor in the volume of water used, and in the experiments carried on water had to be changed frequently — at least once in twelve hours — in order that oxygen might always be present. On a large scale, aëration of the water in the treatment tank might be less expensive than frequent emptying and refilling this tank. This, however, is problematical. (5) The cost of chlorine would be exceedingly small — judging from the work carried on, only a small fraction of a cent per bushel of clams treated. The main cost of operating such a chlorine treatment plant would be in handling the clams and for the adequate salary of a chemist or bacteriologist whom it would be necessary to have as superintendent of the plant in order that the work might be satisfactorily carried on and continual determinations made of the efficiency of the treatment.

At various locations in other States attempts have been made to purify oysters by chlorine treatment but with only partial success. This has undoubtedly been partly due to the difference in shell characteristics of these two classes of shellfish. Oysters in most instances have a large, uneven shell to which much organic matter, marine growths, etc., are often firmly attached, hence they can not be well cleaned by washing before treatment and much chlorine is consumed by this dirt and these growths. Clams, on the other hand, are smooth shelled and easily washed clean, making the chlorine more available for bacterial reduction.

*Shellfish Score of Soft-Shell Clams before and after Chlorine Treatment.***June 27 to August 17, Inclusive.*

RUN NUMBER.	Start.	After 12 Hours.	1 Day.	2 Days.	3 Days.	4 Days.	5 Days.	6 Days.
1	275	—	185	23	46	—	—	0
2	185	—	—	23	—	23	2	—
3	50	—	—	—	37	37	—	—
4	320	—	23	28	—	—	—	5
5	37	—	41	18	—	—	—	—
6	275	—	46	37	—	—	—	—
7	185	140	—	46	—	—	—	—
8	185	28	—	50	—	—	—	—
9†	950	410	320	230	140	—	—	—
10†	50	—	—	50	—	—	—	—
11	185	—	28	14	—	—	—	—
<i>November 3 to 17, Inclusive.</i>								
12	275	—	95	19	—	—	—	—
13	275	—	95	46	3	—	—	—
14	230	—	32	32	—	—	—	—

* All scores are averages of two or more determinations.

† Clams from near the sewer outlet.

‡ No chlorine used.

Data in Regard to Temperature, Dissolved Oxygen, Chlorine Used, etc.

RUN NUMBER.	Start.	Clams Used. (Bushel.)	Average Temperature of Water. (Degrees F.)	AVERAGE DISSOLVED OXYGEN IN TANK NO. 2. (PARTS IN 100,000.)		Average Chlorine Used per Filling. (Parts per 1,000,000.)
				Tank as Filled.	Tank as Emptied.	
1	June 27	1	73	—	—	4.0
2	July 3	1	74	—	.05	4.8
3	July 8	2	75	.50	.05	5.1
4	July 12	1	72	.31	.05	4.3
5	July 18	1½	69	.46	.18	5.0
6	July 20	½	67	.52	.30	5.0
7	July 25	1	70	.40	.16	5.0
8	July 27	1	68	.55	.18	4.5
9	Aug. 1	1	62	.68	.50	5.0
10	Aug. 4	1	66	.42	.20	0.0
11	Aug. 15	1	70	—	—	4.5
12	Nov. 3	1	57	.67	.49	4.3
13	Nov. 8	1	41	.91	.88	4.5
14	Nov. 17	1	50	.84	.79	4.0

Bacteria and Chlorine as Sodium Chloride in Water from Plum Island River used in Purification Experiments before Chlorination.

RUN NUMBER.	1927.	BACTERIA PER CUBIC CENTIMETER.			"Shellfish Score."*	Chlorine. (Parts in 100,000.)
		4 Days 20° C.	24 HOURS — 37° C.			
			Total.	Red.		
1	June 27	280	4	1	14	—
	June 28	25	5	1	5	—
	June 29	300	20	8	50	—
	June 30	850	450	160	50	—
2	July 3	420	100	4	5	1,180
	July 5	400	28	8	5	960
	July 7	250	20	4	23	1,340
3	July 8	350	45	3	2	1,520
	July 11	650	42	15	23	1,040
4	July 12	30	5	2	1	1,440
5	July 18	480	130	5	4	1,010
	July 19	1,400	200	45	50	430
6	July 20	1,300	120	20	5	870
	July 21	750	50	15	23	1,045
7	July 25	750	24	3	14	1,260
8	July 27	350	15	2	4	1,070
	July 27	620	8	3	23	630
9	Aug. 1	1,000	12	3	23	890
10	Aug. 4	710	100	5	5	1,160
	Aug. 5	3,600	240	50	32	—
	Aug. 6	5,000	450	120	50	—
11	Aug. 15	1,000	60	10	1	1,500

*B. coli expressed on same basis as shellfish.

Average Number of Bacteria in Water of Tank No. 1 after Chlorine Treatment as applied to Clams in Tank No. 2.

June 27 to August 17, Inclusive.

BACTERIA PER CUBIC CENTIMETER.				"Shellfish Score."*
4 Days 20° C.	24 HOURS — 37° C.		Total.	
	Red.			
240	7	0.4	0.4	
<i>Average Number of Bacteria in Water of Tank No. 2 Fifteen Minutes after Filling.</i>				
313	12	0.6	0.5	
<i>Average Number of Bacteria in Water of Tank No. 2 when run from Tank.</i>				
6,691	805	148.0	18.0	

*B. coli expressed on same basis as shellfish.

CORROSION STUDIES.

During the past thirty years this Division has made many long-continued investigations in regard to the important subject of the corrosion of pipes by different water supplies. These investigations have included studies of iron, galvanized iron, lead, copper, brass, tin, tin-lined lead, etc. During 1926 and 1927 further studies along this line were made and these studies were summarized in a paper entitled "The Effect of Pipes of Different Metals upon the Quality of Water Supplies," read before the New England Water Works Association. The detailed work would occupy too much space to be given in this report but the following paragraphs summarize a portion of it.

Summarizing the results of these investigations it is evident that whatever pipe is used a certain amount of metal will be taken into solution by the water and this amount varies under different conditions and with different waters; that if the pipe is iron a greater amount is taken than from a pipe of any other metal. Galvanizing an iron pipe prevents to a large extent and for a considerable period the absorption of iron but much zinc is continually taken into solution as long as the galvanizing lasts. Tin-lined pipes are awkward to handle from a plumbing point of view but little tin is taken from them by any water. Brass pipes yield much zinc but generally only minute amounts of copper. Copper pipes yield about the same amount of copper as the brass pipes but zinc is not involved in the corrosion of these pipes except occasionally, certain copper pipes seeming to contain a small amount of zinc. We know from experience in this State that lead in average amounts of .04 of a part in 100,000 in drinking water will cause lead poisoning of certain individuals if habitually used. Occasionally statements have been made by certain investigators in regard to the harmfulness of zinc when present habitually in amounts greater than 2 or 3 parts in 100,000. We have no recorded instances of intestinal or other troubles from zinc in water although this zinc is present in large amounts in practically all waters passing through galvanized iron pipes. It seems hardly possible that the small amount of copper taken generally from brass or copper pipes can cause illness but probably every house piping system should be well flushed out each morning in order that the water which has stood in the pipes overnight may be removed.

In some of this work minute amounts of copper were found in ground and surface waters which had not passed through copper pipes. This is not a cause for surprise as the human system always contains copper taken in with food and of course it is being constantly removed from the system. Shellfish, especially oysters, contain considerable copper, and such grains as wheat, barley, etc., also contain copper which must come from the ground. Brass strainers on driven-well systems also yield copper and zinc.

REPORT OF THE DIVISION OF FOOD AND DRUGS.

HERMANN C. LYTHGOE, *Director*.

The Food and Drug Division of the Massachusetts Department of Public Health has during 1927 been engaged in the usual routine work of the enforcement of the milk, food and drug laws, the cold storage law, the slaughtering laws, the bakery law, the soft drink bottling law, and certain other laws required to be enforced by the Department. The Division has also examined samples of liquor, drugs, chemicals and poisons for Police Departments, and has examined samples of coal for the Division of Standards, for the Commission on the Necessaries of Life, and for certain Sealers of Weights and Measures of cities and towns.

There was an additional inspector appointed to assist in carrying out the provisions of the law relative to the pasteurization of milk.

The inspectors collected and the chemists examined 7,548 samples of milk, of which 158 contained added water and from 180 of which a portion of the milk had been removed. The usual milk statistics will be found in Tables 2 and 3. There were collected and examined 1,845 samples of food, the statistics of which will be found in Table 4. In addition, there were collected a number of samples of shellfish for bacteriological examination by the Division of Water and Sewage Laboratories, which are not included in the samples reported in Table 4. There were collected and examined 169 samples of drugs, the statistics of which are reported in Table 5.

There were 360 prosecutions for violations of the law, the results of which will be found in Table 1. There were 63 prosecutions for the sale of low standard milk, of which 3 were filed without finding, and the balance resulted in conviction. Most of these cases were brought against restaurants which were serving skimmed milk to their patrons instead of whole milk. The complaints, however, were brought under the low standard law, which would give the judge an opportunity of imposing a lower penalty than in the case of the adulterated milk law.

There were 11 prosecutions for the sale of milk from which a portion of the cream was removed, all of which resulted in conviction. These cases were brought mostly against milk dealers and milk producers.

There were 25 prosecutions for the sale of milk containing added water, of which 1 case resulted in a finding of not guilty and 2 were filed without finding. These cases were mostly against milk producers, with a few against milk dealers. There was 1 case for the sale as pasteurized milk of milk not pasteurized as described by the statutes. There was another case for falsely advertising unpasteurized milk as "pasteurized milk." The defendant in each case was found guilty and the case was filed.

There were 4 complaints involved in connection with these 2 cases, — 2 complaints for the sale of milk containing added water and 1 complaint for selling as pasteurized milk, milk which was not pasteurized. These complaints were brought against the corporation. There was another case brought against the principal owner of the corporation for false advertising in connection with the advertising of pasteurized milk. One case for the sale of milk containing added water resulted in a finding of not guilty. The other case resulted in a finding of guilty but the cases were all placed on file. Subsequently, additional samples were obtained from the company, which samples were found to be watered. Another complaint was entered, resulting in a conviction, the removal of one of the prior cases from the file, and the imposition of a fine of \$150.00, which fine was paid.

There were 12 cases for the sale of low standard cream, most of which were obtained in restaurants. All of these cases were convicted. There was one case for the sale of low standard butter, resulting in conviction.

The total cases under the law relating to the sale of milk and milk products were 114, of which 108 resulted in conviction. There were 12 cases relating to the sale of shellfish; 1 case for the sale of watered scallops resulted in conviction; 1 case for the sale of decomposed clams resulted in conviction. Three cases for the false advertising of Ipswich clams and the sale of clams other than Ipswich clams resulted in conviction. There were 7 cases for the sale of clams containing a filthy animal or vegetable substance, specifically, sewage. These clams were clams in

the shell, and the bacteriological examination showed unmistakably that the clams actually contained sewage. One case was discharged because of failure on the part of the court officer to summon the necessary witnesses. The case had previously been continued for the same reason. The other six defendants were found guilty and fined twenty-five dollars upon each count. Appeals were taken in all cases and the appealed cases were disposed of in most instances by pleas of *nolo contendere* and fines were imposed in some instances as expenses. None of the cases came to trial before a jury. This is the first instance in this state of cases of this type being brought to the attention of the courts, and the results of the cases were on the whole satisfactory.

There were 110 cases pertaining to eggs, all resulting in conviction. Of these 89 were for the sale of cold storage eggs without causing the container to be labeled as required by statute. In most of these instances the eggs were actually sold as fresh eggs, but as soon as the sale was made and the identity of the inspection was made known, the storekeeper informed the inspector that the eggs were not fresh eggs but were cold storage eggs. There were 11 cases for falsely advertising eggs which were not fresh as fresh eggs. There were 7 cases for misbranding of eggs, mostly for labeling old eggs as "fresh eggs." Two cases for representing cold storage food as fresh food related to eggs, and there was 1 case for the sale of decomposed eggs.

There were a number of cases for violation of the regulations relative to the labeling of articles of food containing preservatives, 20 of which related to Hamburg steak containing sodium sulphite, of which 19 resulted in conviction. Nine of these cases related to sausages, all of which were convicted. In addition, there were 3 cases for the sale of decomposed Hamburg steak, 2 of which resulted in conviction. There were 2 cases for the sale of sausage containing coloring matter, and 9 cases for the sale of sausages containing cereal in excess of 2%, all of which were convicted. There were 7 convictions for the sale of adulterated maple sugar, and there were 46 cases for the false advertising of maple syrup, mostly in restaurants. One case was found not guilty and 1 defendant defaulted.

The false advertising of maple syrup in restaurants appears to have become epidemic during 1927. Several times prior to 1927 investigations were made as to the advertising of syrups in restaurants, and it was found that generally griddle cakes were advertised as "Griddle Cakes with Syrup." One restaurant keeper at a hearing stated that when he purchased the restaurant the sign on the wall read "Griddle Cakes and Syrup." He had this sign changed to read, "Griddle Cakes and Maple Syrup" because it sounded better.

The proprietor of a high priced establishment who was serving waffles and maple syrup far above the price charged by restaurants elsewhere in the state stated that he adulterated his own maple syrup and that he couldn't afford to furnish pure maple syrup at the price he was charging for his waffles. The saving on the adulteration amounted to about two cents on each order. The gentleman exhibited considerable show of temper at the hearing after he ascertained that he was to be prosecuted, and denied that he had made certain statements which he had previously made during the hearing. It was expected that there would be an interesting session at the trial of the case, but the trial resulted in a plea of guilty and the imposition of a fine.

There was 1 case for the false advertising of frozen custard, resulting in a plea of *nolo contendere* and the imposition of a fine. There was 1 case for violation of the sanitary food law and another case against the same organization for violation of the soft drink law. These cases resulted in conviction and appeal. The corporation went out of existence before the appeal could be heard. The place was closed down and the corporation defaulted in the Superior Court and disposition was made upon the default.

There was 1 case for obstruction of an inspector, resulting in a finding of not guilty. The inspector had never been in the town before and the judge quite properly held that there was a possibility that the inspector was unknown to the man who ran away from him.

There were 5 cases for the sale of adulterated drugs, all resulting in conviction. There was 1 case for violation of the mattress law, resulting in conviction. There

were 11 cases for violation of the slaughtering laws, of which 10 were convicted, and there were 3 other cases relating to the slaughtering laws, 1 for the sale of decomposed meat, and the others relating to the sale of diseased meat. Of these cases relating to diseased meat, 1 man was found not guilty and the other man was convicted. Both cases referred to the same carcass, and in connection with this case the proprietor of the slaughterhouse where the animal was killed was convicted of slaughtering in the absence of the inspector and his license automatically became revoked. Three of the slaughtering cases were against slaughtering inspectors who violated the regulations of the Department.

The only prosecutions for violation of the storage laws were in relation to cold storage eggs.

The inspectors during the year made confiscations as follows:

In stores there were 8 seizures of poultry, amounting to 542 pounds and consisting of 287½ pounds of chicken, 46 pounds of fowl, 145 pounds of geese, and 63½ pounds of turkeys; 7 seizures of meat, amounting to 378 pounds and consisting of 325 pounds of beef, 6 pounds of lamb, 27 pounds of pork, 10 pounds of veal, and 10 pounds of frankforts; and 3 seizures of fish, amounting to 224 pounds of scallops, 35 gallons of clams, and 40 gallons of oysters.

In slaughterhouses there were 5 seizures of meat, amounting to 2,505 pounds, and consisting of 2,325 pounds of beef and 180 pounds of veal.

In cold storage warehouses there was 1 seizure of poultry, weighing 10 pounds; 3 seizures of meat, weighing 400 pounds and consisting of 110 pounds of chitterlings, 125 pounds of hog kidneys, and 165 pounds of ox tails; 2 seizures of game, weighing 39 pounds and consisting of 15 pounds of wild goose, and 24 pounds of venison; 1 seizure of fish, weighing 1,350 pounds; and 1 seizure of chicken fat, weighing 147 pounds.

The law relative to the licensing of pasteurizing plants went into effect on July 15, 1927. The law provides for licensing of pasteurizing plants by the town with the right of revoking the licenses either by the State Health Department or the Town Health Department if the establishment is not operated in accordance with the regulations promulgated by the Massachusetts Department of Public Health. At the time that this was passed it was estimated that there were about 500 pasteurizing plants in the state. This estimate is probably somewhat high, there being probably not much more than 300 plants at present. A preliminary set of regulations was drafted and local boards of health were invited to a meeting to discuss these proposed regulations. At the close of the meeting a committee was selected to work with the Department upon the preliminary draft. A second draft was then prepared and a meeting was held to which the milk dealers were invited. The revised proposed regulations were discussed and a committee was appointed from the dealers present. The regulations were then revised in consultation with the committee from the dealers and a joint meeting of boards of health and milk dealers was held, at which meetings copies of the proposed regulations were distributed for discussion. A subsequent meeting was held at which both the boards of health and the dealers committee met with the Department and the final draft was submitted to the council for adoption. This was adopted within two days of the taking effect of the act and copies were sent to all boards of health in the state. In connection with the preparation of these regulations we experienced more objections from the boards of health than from the milk dealers, notwithstanding the fact that the milk dealers realized that the passage of these regulations meant the expenditure of thousands of dollars on the part of the milk dealers of this state for the installation of new equipment.

A new inspector was appointed to take care of this work. During the fiscal year Dr. Stirrett inspected 189 pasteurizing plants, practically none of which were strictly in accordance with the regulations of the Department. Twenty-three of these plants contained the obsolete Parke Holder and the proprietors of these plants found themselves in a position where it was necessary for them to purchase entire new equipment for carrying on the business of pasteurization. Practically all the plants had defective valves. Many of them did not have the necessary recording thermometer. Many others were inadequately equipped with mercury in glass indicating thermometers.

The policy of the Department in connection with this work has been to inspect the pasteurizing plant in company with the inspector of milk of the town or with some person delegated by the local board of health. In only a few instances were these inspections made in the absence of a representative of the board of health of the town where the plant was located. In some instances the inspector went with a city inspector to all the plants located in and outside of the city where pasteurized milk was prepared for sale in the city. In such instances the inspector of the town was not always present at the inspection. The dealer was given a copy of the regulations and was informed of the corrections to be made. Subsequently letters were sent to the boards of health that had issued no licenses. These letters in most instances resulted in the issuing of the license required by law. At the close of the year, however, there were still a number of boards of health that had declined to issue the licenses required by statute, although the operator of the pasteurizing plant had made application for such license and had submitted the necessary ten dollar (\$10.00) fee therefor. In a few instances the board of health has declined to issue a license when the plant was in strict conformance with the regulations. This failure is being taken up by correspondence with the boards of health. It has been found that with but few exceptions the operators accept the recommendations of the inspectors without question.

It is proposed, as soon as the preliminary inspections have been made, to go through the plants again, and if the plants are not in conformance with the regulations, to request the proprietor of the plant to call at the office of the Department to explain his failure to comply with the law and regulations. The board of health will be given an opportunity to be present at these hearings. If the plant is not then put in shape there will probably be a prosecution upon the third inspection. The preliminary inspections regarding sanitation resulted in a report that 49 of the plants were clean, 88 were dirty, and 42 were very dirty.

One of the chemists employed in the arspenamine factory has been transferred to food and drug work and will carry on bacteriological work at the Lawrence Experiment Station until such time as he is thoroughly qualified to make bacteriological examinations of the milk. It is proposed to make such examination in connection with the inspections of these pasteurization plants, the examination to consist of bacteriological examination of the apparatus used in pasteurization; of the containers used for holding the finished product; and of the milk both before and after pasteurization and at the time of delivery from the plant.

Liquor Samples.

The Police Departments of 144 cities and towns, the Department of Public Safety and the Metropolitan District Commission submitted to the Department for analysis, 8,815 samples of liquor. These samples were classified as follows:

Nineteen hundred and twenty-nine samples of beer, 84 samples of cider, 909 samples of wine, 4,529 samples of distilled spirits, 8 samples of flavoring extracts, 935 samples of alcohol and 421 miscellaneous samples not otherwise classified. Included in this miscellaneous list were mash, still residues, mixtures of intoxicating liquor with other substances, sink drainings, denatured alcohol and certain commercial preparations containing alcohol.

The samples submitted this year are slightly in excess of those submitted during the year 1926, the total for that year being 8,667. The highest number of samples submitted was for the year 1925, when 9,454 samples were submitted. The largest number submitted in any one month during the past year was during March, when 937 samples were submitted. The lowest number submitted was during February, when 627 samples were submitted.

Exclusive of samples of denatured alcohol, the nature of which was apparent to the sense of smell, there were submitted only 8 samples containing methyl alcohol. These samples were as follows:

One sample from Salisbury submitted in July contained 33.9% alcohol, and 1.32% methyl alcohol; 2 samples submitted from Springfield during July contained 24.7% alcohol, 1.15% methyl alcohol and 26.46% alcohol, 1.24% methyl alcohol, respectively; 1 sample submitted from Northampton in April contained 30.3% alcohol and 2.2% methyl alcohol; 1 sample submitted from Fitchburg in

December, 1926, contained 30.9% alcohol and 1.4% methyl alcohol. In April there was a sample of alcohol submitted from Springfield containing 83.86% alcohol and 2.8% methyl alcohol. During July, 2 samples were submitted from Boston containing 85% alcohol and 6% methyl alcohol.

A number of samples of denatured alcohol containing pyridine were submitted as well as samples of medicated alcohol containing zinc sulphocarbolate, formaldehyde and diethylphthalate. Two samples of canned heat were submitted. This material contained approximately 80% alcohol and 2% methyl alcohol. Apart from the possible danger due to the presence of these denaturants, the distilled spirits and the alcohol submitted contained nothing more injurious than alcohol which is a well recognized toxic substance capable of causing death when used in too high a concentration in too short a space of time.

Excluding those samples containing methyl alcohol which apparently were of a known beverage character by the sense of smell, only 0.13% of the distilled spirits and alcohol contained any methyl alcohol, and in all these instances the concentration of methyl alcohol was very low.

Table 6 gives a list of cities submitting liquor samples and towns which submitted more than 20 samples during 1927.

A few special investigations were made during the course of the year.

At the request of the U. S. Department of Agriculture, an investigation was made as to citrous fruit shipped to Western Massachusetts from Florida. The Department of Agriculture had made a number of seizures throughout the country of shipments of frozen oranges. This investigation was made in Springfield and Holyoke. In all, inspections were made of 943 crates or cartons. Only a very slight amount of this fruit was found to be damaged by frost. The containers were sampled in accordance with the methods of the Department of Agriculture. For example, in the case of a shipment of 250 crates, 10 crates were taken at random and were opened and 2 oranges were taken from each crate. These 20 oranges were then opened and 3 were found to be touched with frost. In another shipment of 250 crates, 2 oranges were found to be frost bitten. In another shipment involving 340 crates, samples being taken from 12 crates, 2 oranges were found to be decomposed and 2 were frost bitten.

In the early part of the year there was an unusual shortage of butter, resulting in a rapid withdrawal of butter from storage. An investigation was therefore made of the condition of the butter on the market as received from without the state. In only a very few instances was this butter found to be deficient in fat, and as soon as the dealers became aware of activities of the Department the shipments of this type of butter ceased.

Cold Storage.

There were 65 licensed cold storage warehouses operating in Massachusetts during the year. A sanitary inspection of the premises of these warehouses disclosed nothing requiring any radical action. Except for the sale of cold storage eggs, the few minor violations which occurred were taken care of other than by prosecution.

Tables 7 and 8, 9, and 10 give the amount of articles placed in storage during each calendar month and the amount of articles on hand in storage on the first day of each calendar month.

Compared with former years, the holdings of beef, pork, and eggs have shown a drop. The holdings of poultry and butter are more nearly uniform. There was a slight surplus of storage of chickens, halibut, and mackerel during 1926, which necessitated the granting of extensions of time in storage in some instances.

A summary of the action on requests for extension of time and articles which have been in cold storage for twelve months without receipt of requests for extension of time will be found in tables 11, 12, and 13.

Slaughtering Inspection.

The law requires cities and towns to annually in March nominate one or more inspectors of slaughtering, which inspectors may be appointed by the board of health after the nominations have been approved by the Department. There

were 475 names submitted, of which 26 were disapproved as being not properly qualified to carry out the work. Of the persons approved 433 were renommees, who had been carrying out the work in a satisfactory manner as per the records of the Department. Twenty-five names submitted and approved were of persons who had not previously held the position.

One town sent in the name of an absolutely incompetent man, which the Department disapproved. The day the disapproval letter went into the mail a telephone call was received from the chairman of the board of health of the town making the nomination asking what was to be done. He was informed that the nominee would be disapproved, whereupon he remarked that he expected he would be because he did not know anything about the business. The chairman of the board was asked why he sent in the name of an incompetent man and put the commonwealth to the expense of sending our inspector upon a long railway journey to ascertain that the nominee was incompetent when the board knew it at the time the name was sent in. The answer indicated that it was political expediency to nominate this man.

Some of the disapproved nominees informed the inspector of this Department that they did not care for the position after they had been instructed in the duties which must be performed and told of the penalties for failure to perform such duties. In many of these instances the nominee had informed the board of health that he would do the work for considerably less money than the incumbent was being paid. Occasionally a board of health declines to send in the name of the incumbent because of his efficiency in confiscating carcasses. When this occurs, the board usually has considerable difficulty in finding a properly qualified man to carry on the work.

Each inspector of slaughtering is required to send a monthly report to the Department stating the number of animals passed for food purposes; the number of animals condemned; and the reasons for confiscation. These reports are looked over each month by one of the veterinary inspectors. If the local inspector appears to be passing more carcasses than the law of average indicates should be passed he is visited by an inspector of this Department to ascertain the reason for the character of report submitted.

There are of course occasional instances where the inspector of slaughtering does not intend to do the work as the statute requires. Fortunately, however, these instances are few. There are other instances where an inspector is doubtful as to what his action should be. Frequently these inspectors call upon the Department for advice and whenever possible an inspector is sent from the Department to look over the carcasses in question and advise the slaughtering inspector what action he should take.

Bakeries.

Bakeries were inspected in most of the cities and some towns during the year. The bakeries were found to be in much better condition than they were when the law went into effect. The usual procedure of making the inspections in company with the agent of the local board was followed. The board of health was given a letter stating the defects found, with a request that the defects be remedied. Generally the local board of health saw to it that the bakeries were cleaned up. Occasionally the local board was found to be lax and the proprietor of the bakery was called to the State House for a hearing and was told to put the bakery in satisfactory shape.

In one instance the board of health requested help on the bakeries. An inspector was sent to look them over. The board was informed of the defects found and two weeks afterwards the same inspector went to the town and looked over the bakeries. He reported that all the causes for criticism had been removed and the local authorities had done a very good job in the clean-up work.

Mattresses.

A few complaints were received relative to alleged law violations in mattress factories. These complaints were investigated and in only one instance was sufficient

evidence gathered to warrant prosecution. Without doubt, considerable second-hand material is used in the making of mattresses and the mattresses are sold with a tag to the effect that the material is all new. It is impossible to tell by an examination of the contents of a mattress whether or not the material has been used before and is therefore second-hand within the meaning of the law. In many instances where the material was apparently second-hand, the mattress manufacturer brought affidavits from the person who furnished the material stating that the material was all new. The mattresses are labeled correctly in all but few instances with the names of the ingredients used in their manufacture. The existing conditions relative to the use of second-hand material in mattresses apparently cannot be remedied by legislation. We have been informed that retail dealers go to mattress manufacturers and demand a mattress labeled in accordance with the Massachusetts law as containing all new material, which can be sold at a remarkably low price. As long as the mattress trade desires to do business in this way, mattress manufacturers will furnish cheap mattresses made of second-hand material. Incidentally, the use of second-hand material in making mattresses is for practical purposes no health menace.

Arsphenamine.

Because of a reduction in the price of commercial arsphenamine, it was decided to cease the manufacture of arsphenamine, and consequently the laboratory was shut down on the seventh day of August. The arsphenamine laboratory was operated with as small a force as possible to make the material demanded of the Department. It would have been possible with the same force and equipment to produce considerably more arsphenamine and sulpharsphenamine than was actually distributed, but it was not possible to reduce the number of employees and do the work. When it was deemed advisable to discontinue the manufacture of arsphenamine, the output of the laboratory was increased. One of the technical men obtained a good position and left the Department. Under the circumstances he was not replaced. This made the supervising of the work much more difficult for Mr. Nurenberg, who was in charge of the laboratory. After the last batch had been made the entire available force was put on the work of ampouling and boxing the material. It was estimated at that time that the amount of arsphenamine prepared during the first nine months of the year would be sufficient to last until the first day of March, and the amount of material on hand on the first day of December indicates that this estimate was substantially correct.

The statistics of the distribution of arsphenamine indicated a drop in the consumption of arsphenamine and an increase in the consumption of sulpharsphenamine. The distribution of the combined arsenicals was approximately 47,000 doses per annum. The distribution in 1923, before the manufacture of sulpharsphenamine was begun, was about 49,000 doses per annum. The distribution of arsphenamine in 1927 was approximately 23,000 doses per annum. The distribution of arsenicals showed a seasonal variation. The low point occurred in February; the high point in March. There was a gradual reduction to another low point in July and a high point again in August.

This ends a very interesting piece of work in connection with the manufacture and distribution of an article of this character.

The preliminary research work was completed in the latter part of 1916. At the end of 1917 the Department was in the position of being able to begin commercial distribution of the drug. Commercial distribution was begun in 1918 and by the close of 1919 we were distributing about 18,000 doses per annum. At the close of 1920 this had increased to about 25,000 doses per annum. At the close of 1921 it had increased to 38,000 doses per annum. At the close of 1922 it had reached 40,000 doses per annum, and at the end of 1923 it had reached the maximum of nearly 50,000 doses per annum. From 1923 to date the distribution of arsenicals has varied between 42,000 and 50,000 doses per annum.

At the time the laboratory shut down, Dr. Hunt reported that the sulpharsphenamine prepared by the Department was without doubt the finest on the American market. This same remark was made by the agent of one of the companies that was bidding for the business of the Department.

TABLE 1. — *For Sale of Milk not of Good Standard Quality.*

NAME.	Address.	Court.	Date.	Result.
Alexander, John	Worcester	Worcester	Apr. 12, 1927	Conviction.
Anagnos, Michael	Nantucket	Nantucket	Aug. 23, 1927	Conviction.
Anther, Camila	Holyoke	Holyoke	Nov. 29, 1927	Conviction.
Atnes, Louis	Nantasket	Hingham.	July 22, 1927	Conviction.
Bamvakas, Angelo	Newton	Newton	July 6, 1927	Conviction.
Bauer, Fred	Buckland	Greenfield	Dec. 14, 1926	Conviction.
Bean, Fred O.	Springfield	Springfield	Mar. 30, 1927	Conviction.
Bonazoli, Albert	Newton Centre	Newton	Sept. 7, 1927	Conviction.
Casey, John	Great Barrington	Great Barrington	June 3, 1927	Conviction.
Chong, Harry S.	Springfield	Springfield	Jan. 18, 1927	Conviction.
Chouchos, George	Cambridge	Cambridge	Jan. 18, 1927	Conviction.
Christian, Henry	Holyoke	Holyoke	Nov. 9, 1927	Conviction.
Christopoulos, Chris	Buzzards Bay	Barnstable	Sept. 15, 1927	Conviction.
Conaires, Charles	Milford	Milford	Sept. 8, 1927	-1
Crest, Benny	Westboro	Westboro	Apr. 8, 1927	-2
Cutulis, James A.	Newton	Newton	Sept. 7, 1927	Conviction.
Dascale, Nicholas	Newburyport	Newburyport	Jan. 21, 1927	Conviction.
Demos, Charles	Pittsfield	Pittsfield	Dec. 10, 1926	Conviction.
Demos, Charles	Pittsfield	Pittsfield	Dec. 10, 1926	Conviction.
Denaro, Joseph	Concord	Concord	Apr. 14, 1927	Conviction.
Economy, George	Rockland	Abington.	May 17, 1927	Conviction.
Fisher, Harold	Springfield	Springfield	Jan. 11, 1927	Conviction.
Gaissou, Louis Z.	New Bedford	New Bedford	Aug. 19, 1927	Conviction.
Gandini, Eugene	Springfield	Springfield	Oct. 27, 1927	Conviction.
Halpern, Samuel	Westboro	Westboro	Apr. 8, 1927	-2
Jackson Confectionery Company, Inc.	Springfield	Springfield	Oct. 27, 1927	Conviction.
Johnson, Chrisoplias	New Bedford	New Bedford	Aug. 15, 1927	Conviction.
Kairis, Joseph	Worcester	Worcester	Dec. 2, 1926	Conviction.
King, Charlie	Plymouth	Plymouth	Aug. 19, 1927	Conviction. ³
Liggetts Drug Company	Holyoke	Holyoke	Nov. 29, 1927	Conviction.
Manolidas, John	Whitman	Abington.	May 17, 1927	Conviction.
Mazzolini, Augustas	Holyoke	Holyoke	Nov. 29, 1927	Conviction.
McKenna, Harold	Cambridge	Cambridge	Jan. 18, 1927	Conviction.
Moceup, Allan C.	Fall River	Fall River	July 15, 1927	Conviction.
Nardine, Joseph	Cambridge	Cambridge	Jan. 18, 1927	Conviction.
Nogueira, Joseph	Plymouth	Plymouth	June 28, 1927	Conviction.
Oestrides, Nick	Onset	Wareham	Sept. 23, 1927	Conviction.
Orsini, Andrew	Holyoke	Holyoke	Nov. 29, 1927	Conviction.
Papadoycanis, Ernest C.	Attleboro	Attleboro	July 27, 1927	Conviction.
Papanicou, John	Boston	Boston	June 16, 1927	Conviction.
Pappas, George	Nantasket	Hingham.	July 22, 1927	Conviction.
Pappas, Jordan	New Bedford	New Bedford	Aug. 15, 1927	Conviction.
Pappas, Nicholas	Bridgewater	Brookton.	Aug. 25, 1927	Conviction.
Quality Cafeteria, Inc.	Somerville	Somerville	June 23, 1927	Conviction.
Quong, Chin	Greenfield	Greenfield	Dec. 14, 1926	Conviction.
Rego, Frank	Fall River	Fall River	Sept. 27, 1927	Conviction.
Rigali, Fred	Holyoke	Holyoke	Nov. 29, 1927	Conviction.
Rounacker, Michael	Turners Falls	Greenfield	July 29, 1927	Conviction. ³
Scomvas, Nicholas	Marlboro	Marlboro	Jan. 27, 1927	Conviction.
Shee, John Log	Worcester	Worcester	Dec. 2, 1926	Conviction.
Shee, John Log	Worcester	Worcester	Apr. 25, 1927	Conviction.
Stathis, Anthony	Somerville	Somerville	June 23, 1927	Conviction.
Steve, Alex	Holyoke	Holyoke	Jan. 7, 1927	Conviction.
Theodore, Peter	Chicopee	Chicopee	June 24, 1927	Conviction.
Thompson, Frederick E.	Westboro	Westboro	Apr. 8, 1927	-2
Toohy, John	Marlboro	Marlboro	Jan. 27, 1927	Conviction.
Van Dyk Company, James	Springfield	Springfield	Dec. 23, 1926	Conviction. ¹
Vincent, James	Waltham.	Waltham.	Aug. 17, 1927	Conviction.
Waldorf System, Inc.	Worcester	Worcester	Apr. 12, 1927	Conviction.
Waldorf System, Inc.	Pittsfield	Pittsfield	Apr. 13, 1927	Conviction.
Whelton, Charles P.	Greenfield	Greenfield	Dec. 14, 1926	Conviction.
Wolski, Mary H.	Cambridge	Cambridge	Sept. 2, 1927	Conviction.
Zahos, John	Salisbury Beach	Amesbury	Sept. 14, 1927	Conviction. ³

For Sale of Milk from which a Portion of the Cream had been removed.

Barrier, Marshall	Franklin	Franklin	Apr. 23, 1927	Conviction.
Busby, Roy W.	Great Barrington	Great Barrington	June 15, 1927	Conviction.
Busby, Roy W.	Great Barrington	Great Barrington	June 15, 1927	Conviction.
Busby, Roy W.	Great Barrington	Great Barrington	June 15, 1927	Conviction.
Gilhooley, Michael	Gardner	Gardner	Feb. 11, 1927	Conviction.
Hood & Sons, Inc., H. P.	Sudbury	Framingham	May 16, 1927	Conviction.
Kirchner, Joseph W.	Pittsfield	Pittsfield	Apr. 13, 1927	Conviction. ³
Leonard, Edward D.	Athol	Athol	May 16, 1927	Conviction.
Soares, Manuel S.	New Bedford	New Bedford	July 5, 1927	Conviction. ³
Tallent, Robert	Millis	Walpole	July 10, 1927	Conviction.
Woolworth Company, F. W.	Fall River	Fall River	Dec. 14, 1926	Conviction.

For Sale of Milk containing Added Water.

Alexsander, Paul	South Sudbury	Waltham.	June 20, 1927	Conviction.
Bega, Peter	Milford	Milford	Oct. 31, 1927	Conviction.
Benz, Charles F.	East New Lenox	Pittsfield	Apr. 13, 1927	Conviction.
Brown, Albert M.	Harvard	Clinton	Apr. 15, 1927	Conviction.

¹ Filed without finding.² Placed on file before adjudication.³ Appealed.

For Sale of Milk containing Added Water—Concluded.

Buderick, John W.	Waltham.	Waltham.	June 20, 1927	Conviction.
Costa, Jesse	Tiverton, R. I.	Fall River	July 25, 1927	Conviction.
Cox, George W.	West Bridgewater	Brookton.	Nov. 21, 1927	Conviction.
Fachini, Anthony	North Adams.	North Adams.	May 17, 1927	Conviction. ¹
Floyd Milk Company	Winthrop	East Boston	June 30, 1927	Conviction.
Floyd Milk Company	Winthrop	East Boston	June 30, 1927	Discharged.
Harrison, Benjamin M.	Acton	Concord	Oct. 7, 1927	Conviction.
Janakonis, Mary	Bridgewater	Brookton.	Nov. 14, 1927	Conviction.
Kahayan, Garabed	Stow	Hudson	Apr. 20, 1927	Conviction.
Kielbasa, John	Westfield.	Westfield.	Jan. 8, 1927	Conviction.
Kohlrusch, George E.	Westford.	Ayer	Apr. 28, 1927	Conviction.
Maffei, Giacomo	Clinton	Clinton	Apr. 29, 1927	Conviction.
Merden, John	Milford	Milford	Sept. 8, 1927	— ²
Mortensen, Erner H.	Holliston.	Franklin	Apr. 23, 1927	Conviction.
Proulx, Ovide	Southbridge	Southbridge	Jan. 7, 1927	Conviction.
Rummo, Frank	Milford	Milford	Sept. 8, 1927	— ²
Saukalowitz, Stanley	Millville	Blackstone	Dec. 10, 1926	Conviction.
Smith, John	Newburyport.	Newburyport.	Oct. 20, 1927	Conviction.
Staniunas, Anthony	Bolton	Clinton	Apr. 29, 1927	Conviction.
Steele, Seraphin G.	Provincetown.	Provincetown.	Oct. 27, 1927	Conviction.
Talent, Robert.	Millis	Franklin	Apr. 23, 1927	Conviction.

Selling as Pasteurized Milk, Milk which was not Pasteurized.

Floyd Milk Company	Winthrop	East Boston	June 30, 1927	Conviction.
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For Sale of Cream not of Good Standard Quality.

NAME.	Address.	Court.	Date.	Result.
Boulevard Restaurant & Coffee Pot, Inc.	Pittsfield.	Pittsfield.	Jan. 25, 1927	Conviction.
Brockelman Brothers Company, Inc.	Lowell	Lowell	Jan. 3, 1927	Conviction.
Dakis, William A.	Holyoke	Holyoke	Feb. 16, 1927	Conviction.
Dascale, Nicholas	Newburyport.	Newburyport.	Jan. 21, 1927	Conviction.
Fun, Joe	Holyoke	Holyoke	Feb. 16, 1927	Conviction.
Jim, Charlie	Lynn	Lynn	Feb. 24, 1927	Conviction.
Kokaras, James	Amesbury	Amesbury	Feb. 25, 1927	Conviction.
Lampropoulous, Peter	Lowell	Lowell	Feb. 21, 1927	Conviction.
Lang, Ung	Springfield	Springfield	Jan. 11, 1927	Conviction.
Wong, Kam A.	Lawrence	Lawrence	Dec. 23, 1926	Conviction. ³
Wong, Kam A.	Lawrence	Lawrence	Dec. 23, 1926	Conviction. ³
Wong, P. Howe	Northampton.	Northampton.	Jan. 20, 1927	Conviction.

For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products.

BUTTER.

[Low Standard.]

Franklin Creameries, Incorporated.	Springfield	Springfield	Dec. 23, 1926	Conviction.
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CLAMS.

[Sewage Polluted.]

Collins, Bernard	Boston	Boston	Aug. 29, 1927	Conviction. ³
Duffy, Joseph	Revere	Boston	Nov. 4, 1927	Conviction. ³
Duffy, William F.	Revere	Boston	Nov. 4, 1927	Conviction. ³
Freeman, Damon W.	Winthrop	Boston	Nov. 4, 1927	Conviction. ³
Miller, Lawrence C.	Ipswich	Boston	Nov. 4, 1927	Discharged.
Smart, Albert A.	Lynn	Boston	Nov. 4, 1927	Conviction. ³
Wells, Victor R.	Winthrop	Boston	Nov. 4, 1927	Conviction. ³

EGGS.

[Misbranded.]

Dold Packing Company, Jacob	Buffalo, N. Y.	Northampton.	Mar. 10, 1927	Conviction.
Gold, David	Springfield	Springfield	Mar. 30, 1927	Conviction.
Gold, David	Springfield	Springfield	Mar. 30, 1927	Conviction.
Kaizer, Bernard	Worcester	Worcester	Dec. 2, 1926	Conviction. ³
Libby, John H.	Providence, R. I.	Fall River	Dec. 14, 1926	Conviction.
Thayer, William J.	Worcester	Worcester	Dec. 2, 1926	Conviction. ³
Whitfield, William W.	Providence, R. I.	Fall River	Dec. 14, 1926	Conviction.

HAMBURG STEAK.

[Selling, or Offering for Sale, Meat Containing Sodium Sulphite in Violation of the Regulations of the Department of Public Health.]

Barron, Benjamin L.	Somerville	Somerville	Feb. 8, 1927	Conviction.
Dobosz, John	Holyoke	Holyoke	May 25, 1927	Conviction.
Fitts Brothers, Incorporated.	Framingham	Framingham	Apr. 11, 1927	Conviction.
Goodstine, Abraham	Roxbury	Roxbury	Mar. 11, 1927	Conviction.
Jacobson, Louis	Fitchburg	Fitchburg	Mar. 8, 1927	Conviction.
Kilduff, Thomas M.	Roxbury	Roxbury	Mar. 11, 1927	Conviction.

¹ Sentence suspended.² Filed without finding.³ Appealed.

For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products —
Concluded.

HAMBURG STEAK—Concluded.

Kline, William	Lynn	Lynn	Feb. 24, 1927	Conviction.
Lebow, William	Cambridge	Cambridge	Jan. 18, 1927	Conviction.
Matusek, Frank	Holyoke	Holyoke	Feb. 2, 1927	Conviction.
Miller, Phillip	Somerville	Somerville	Feb. 23, 1927	Conviction.
Munafu, Guy	Boston	Boston	Apr. 5, 1927	Conviction.
Naznayko, Michael	Northampton	Northampton	Mar. 30, 1927	Conviction.
Parent, John	Haverhill	Haverhill	Dec. 28, 1926	Discharged.
Porter, John	Brookline	Brookline	Jan. 13, 1927	Dismissed.
Porter, Ruben	Brookline	Brookline	Jan. 13, 1927	Conviction.
Sawyer, Morris	Taunton	Taunton	Jan. 28, 1927	Conviction.
Sava, Samuel	Brookline	Brookline	Jan. 27, 1927	Dismissed.
Waks, David	Boston	Dorchester	Jan. 12, 1927	Conviction.
Ward, Jacob	Brookline	Brookline	Jan. 21, 1927	Conviction.
Woburn Provision Company, Inc.	Woburn	Woburn	Mar. 1, 1927	Conviction.

MAPLE SUGAR.

[Contained cane sugar other than maple.]

Albani Lunch Company	Boston	Boston	June 18, 1927	Conviction.
Alpha Lunch Company	Worcester	Worcester	Mar. 22, 1927	Conviction. ¹
Maliotis, Charles	Boston	Boston	June 16, 1927	Conviction. ¹
Papanicou, John	Boston	Boston	June 16, 1927	Conviction.
Parker, Charles W.	Worcester	Worcester	Apr. 12, 1927	Conviction.
Stathis, Anthony	Somerville	Somerville	June 23, 1927	Conviction.
Vincensini, Phillip	Boston	Boston	June 18, 1927	Conviction.

SAUSAGE.

[Contained starch in excess of 2 per cent.]

Bartz, Frank	Boston	Boston	Feb. 15, 1927	Conviction.
Beargeon, Edgar	Springfield	Springfield	Mar. 30, 1927	Conviction.
Felteau, Hubert J.	Lynn	Lynn	Mar. 7, 1927	Conviction.
Hunt Company, A. C.	Springfield	Westfield	Feb. 10, 1927	Conviction.
La Liberte, Antoine	Lowell	Lowell	Feb. 3, 1927	Conviction.
La Liberte, Honore	Holyoke	Holyoke	Feb. 2, 1927	Conviction.
La Liberte, Honore	Holyoke	Holyoke	Apr. 8, 1927	Conviction.
Manley, Arthur	Methuen	Lawrence	Dec. 17, 1926	Conviction.
Sitarz, Stanislaw	Chicopee	Springfield	May 19, 1927	Conviction.

SAUSAGE.

[Contained coloring matter.]

Bartz, Frank	Boston	Boston	Nov. 23, 1927	Conviction.
Cesati, Edmund	Haverhill	Haverhill	Dec. 28, 1926	Conviction.

SAUSAGE.

[Contained a compound of sulphur dioxide not properly labeled.]

NAME.	Address.	Court.	Date.	Result.
Arntz, Bernard J.	Jamaica Plain	West Roxbury	Feb. 28, 1927	Conviction.
Bartz, Frank	Boston	Boston	Nov. 23, 1927	Conviction.
Beauchamp, Ovilla	Holyoke	Northampton	Jan. 20, 1927	Conviction.
Kocot, Boleslaw	Northampton	Northampton	Jan. 20, 1927	Conviction.
Kusnierz, Peter	Holyoke	Holyoke	Feb. 2, 1927	Conviction.
Lenarcon, Michael	Holyoke	Holyoke	Jan. 6, 1927	Conviction.
Meyer, William B.	Somerville	Malden	Feb. 17, 1927	Conviction.
Popielarczyk, Stanley	Northampton	Northampton	Jan. 20, 1927	Conviction.
Solomon, Samuel	Springfield	Springfield	Mar. 30, 1927	Conviction.

SCALLOPS.

[Contained added water.]

First National Stores, Incorporated	Brookline	Brookline	July 19, 1927	Conviction.
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SOFT DRINKS.

[Contained benzoic acid.]

Ducharme, Ephrine	Chicopee	Springfield	Apr. 5, 1927	Conviction.
Kuczarski, Frank A.	Springfield	Springfield	Apr. 20, 1927	Conviction.
Lipovsk, Max	Springfield	Springfield	Mar. 30, 1927	Conviction.

SOFT DRINK.

[Misbranded.]

Dunphy, William	Salem	Salem	Nov. 15, 1926	Conviction.
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For Sale of Decomposed Food.

CLAMS.

Fitts Brothers, Inc.	Framingham].	Framingham	Nov. 22, 1927	Conviction.
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EGGS.

Silva, Manuel	Lowell	Lowell	Dec. 20, 1926	Conviction.
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¹Appealed.

For Sale of Decomposed Food—Concluded.

HAMBURG STEAK.

Great Atlantic & Pacific Tea Company	Framingham	Framingham	Feb. 7, 1927	Conviction.
Zass, Herman	Fall River	Fall River	Jan. 7, 1927	Discharged.
Zass, Louis	Fall River	Fall River	Jan. 7, 1927	Conviction. ³

False and Misleading Advertising.

CLAMS.

[Falsely Advertising as Ipswich Clams.]

Biggins, Thomas J.	Peabody	Peabody	Aug. 16, 1927	Conviction.
Doonan, Owen W.	North Saugus	Lynn	Aug. 26, 1927	Conviction.
Watson, Edward E.	Lynnfield	Peabody	Aug. 16, 1927	Conviction.

FROZEN CUSTARD.

McEwen, Thomas R.	Springfield	Springfield	Oct. 27, 1927	Conviction.
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EGGS.

[Sale of Eggs which were not Fresh as Fresh Eggs.]

Alpert, Samuel	Attleboro	Attleboro	Dec. 21, 1926	Conviction.
Bogdornoff, Max	Lowell	Lowell	Feb. 4, 1927	Conviction.
Dakin Company, Incorporated, H. L.	Worcester	Worcester	Dec. 2, 1926	Conviction. ³
Dakin Company, Incorporated, H. L.	Worcester	Worcester	Dec. 2, 1926	Conviction. ³
Hannaford, Louise	Lexington	Concord	Sept. 14, 1927	Conviction.
Kaizer, Bernard	Worcester	Worcester	Dec. 2, 1926	Conviction. ³
Ladabouche, Robert	Fitchburg	Fitchburg	Jan. 7, 1927	Conviction.
Quimby, Albert P.	Essex	Gloucester	Sept. 1, 1927	Conviction.
Strecker, Ernest	Lawrence	Lawrence	Nov. 18, 1927	Conviction. ³
Sullivan, Patrick A.	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Varros, Peter	Brockton	Brockton	Jan. 10, 1927	Conviction.

MAPLE SYRUP.

Astoria Cafeteria	Boston	Boston	June 17, 1927	Conviction.
Boulevard Restaurant & Coffee Pot, Inc.	Pittsfield	Pittsfield	Jan. 25, 1927	Conviction.
Boylston Cafeteria, Incorporated	Boston	Boston	June 17, 1927	Conviction.
Brockelman Brothers Company, Inc.	Lowell	Lowell	Jan. 3, 1927	Conviction.
Burns, Harry	Fall River	Fall River	Nov. 11, 1927	Conviction.
Buyukles, Theodore	Northampton	Northampton	Mar. 30, 1927	Conviction.
Chimes Spa, Inc.	Boston	Boston	June 16, 1927	Conviction.
Chouchos, George	Cambridge	Cambridge	June 29, 1927	Conviction.
Conaris, Charles	Milford	Milford	Sept. 8, 1927	Conviction.
Demeo, Louis	Waltham	Waltham	Aug. 17, 1927	Conviction.
Demetros, John	Springfield	Springfield	May 24, 1927	Conviction.
Dip, Lee	Lawrence	Lawrence	Dec. 23, 1926	Conviction. ¹
Dondi, Edward	Pittsfield	Pittsfield	Jan. 25, 1927	Conviction.
Durakis, Anthony E.	Cambridge	Cambridge	June 29, 1927	Conviction.
Fisher, Lewis G.	Lowell	Lowell	Jan. 17, 1927	Conviction.
Georgens, James	Roxbury	Roxbury	June 29, 1927	Conviction.
Georgian, John E.	Cambridge	Cambridge	Dec. 13, 1926	Conviction.
Healey, Thomas J.	Lowell	Lowell	Feb. 4, 1927	Conviction.
Ing, Wong	Lawrence	Lawrence	Dec. 17, 1926	Conviction.
Jackson's Confectionery Company	Holyoke	Holyoke	Mar. 18, 1927	Conviction.
Johnson, Chrisoplais	New Bedford	New Bedford	Aug. 15, 1927	Conviction.
Kalenus, Harry	Lawrence	Lawrence	Mar. 7, 1927	Conviction. ²
King, Charlie	Plymouth	Plymouth	Aug. 19, 1927	Conviction. ³
Loukas, Theodore H.	Cambridge	Cambridge	Sept. 2, 1927	Conviction.
Mataliotis, George	Boston	Boston	June 16, 1927	Conviction.
Morgan, Harry V.	Lawrence	Lawrence	Mar. 14, 1927	Conviction. ²
Nangin, Yee	Brighton	Brighton	Nov. 6, 1927	Discharged.
Newberry Company, J. J.	Worcester	Worcester	Mar. 17, 1927	Conviction. ³
Papouleas, Alexander	Salem	Salem	Jan. 14, 1927	Conviction.
Papp, John J.	Boston	Boston	July 13, 1927	Conviction.
Pappas, Nicholas	Lowell	Lowell	Dec. 20, 1926	Conviction.
Peterson, Douglas	Holyoke	Holyoke	Mar. 25, 1927	Conviction.
Princess Cafeteria, Incorporated	Medford	Malden	Feb. 25, 1927	Conviction.
Puritan Lunch, Inc.	Roxbury	Roxbury	June 29, 1927	Conviction. ³
Puritan Lunch, Inc.	Roxbury	Roxbury	July 1, 1927	Conviction. ³
Rudman, Abraham A.	Cambridge	Cambridge	Dec. 13, 1926	Conviction.
Shea, Alfred J.	Boston	Boston	June 16, 1927	Conviction.
Sterling Cafeteria, Incorporated	Roxbury	Roxbury	June 29, 1927	Conviction.
Sterling Cafeteria, Incorporated	Roxbury	Roxbury	July 1, 1927	Conviction.

¹ Continued indefinitely for sentence.² Fined \$10.00; sentence suspended.³ Appealed.

False and Misleading Advertising — Concluded.

MAPLE SYRUP—Concluded.

Stritas, John	Cambridge	Cambridge	Dec. 13, 1926	Conviction.
Trites, John	Middleboro	Middleboro	May 24, 1927	Conviction.
University Cafeteria, Incorporated	Cambridge	Cambridge	Dec. 31, 1926	Conviction.
Wellworth Service Stores, Inc.	Framingham	Framingham	July 7, 1927	Conviction.
Whiting Cafeteria, Incorporated	Boston	Boston	June 16, 1927	Conviction.
Wong, Frank	Gloucester	Gloucester	Sept. 9, 1927	Conviction.
Worthy Lunch Company, Incorporated	Boston	Boston	July 13, 1927	Defaulted.

PASTEURIZED MILK.

Johnson, William L.	Winthrop	East Boston	June 30, 1927	Conviction.
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For Sale of Drugs Deficient in Strength.

LIME WATER.

Finn, Manuel	Malden	Malden	Mar. 15, 1927	Conviction.
Walsh, John B.	Brookline	Brookline	Jan. 21, 1927	Conviction.

SWEET SPIRIT OF NITRE.

Earls, Edward O.	Fitchburg	Fitchburg	Apr. 8, 1927	Conviction.
Finn, Manuel	Malden	Malden	Mar. 15, 1927	Conviction.
Murphy Company, Inc., Eugene J.	Fitchburg	Fitchburg	Apr. 8, 1927	Conviction.

For Violation of the Laws relative to Cold Storage.

SELLING COLD STORAGE EGGS WITHOUT MARKING THE CONTAINER.

Abraham, Henry	South Boston	South Boston	Feb. 14, 1927	Conviction.
Aleknas, Joseph M.	Milford	Milford	Jan. 24, 1927	Conviction.
Anselmo, Antonio	New Bedford	New Bedford	Feb. 4, 1927	Conviction.
Angelakis, Louis	Lynn	Lynn	Feb. 24, 1927	Conviction.
Ash, Louis	Fall River	Fall River	Dec. 14, 1926	Conviction.
Baranow, Pawal	Lowell	Lowell	Jan. 17, 1927	Conviction.
Berthame, Armond	Turners Falls	Greenfield	Dec. 14, 1926	Conviction.
Bisson, Romeo	Fall River	Fall River	Dec. 14, 1926	Conviction.
Bistowski, Frank	Lowell	Lowell	Dec. 27, 1926	Conviction.
Boyajian, Michael	New Bedford	New Bedford	Jan. 20, 1927	Conviction.
Broxian, Sarkis	Lowell	Lowell	Dec. 20, 1926	Conviction.
Brox, Nicholas	Lawrence	Lawrence	Dec. 17, 1926	Conviction.
Bulavko, Nicholas	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Chausse, Aldige	New Bedford	New Bedford	Feb. 18, 1927	Conviction.
Chipouras, Peter	Lynn	Lynn	Feb. 24, 1927	Conviction.
Christopher, George	Cambridge	Cambridge	Jan. 18, 1927	Conviction.
Cincotta, Felix	Marlboro	Marlboro	Jan. 27, 1927	Conviction.
Cohen, Morris	Chelsea	Chelsea	Feb. 8, 1927	Conviction.
Conlomb, Oscar	Fall River	Fall River	Dec. 14, 1926	Conviction.
Corey, William	Lawrence	Lawrence	Feb. 18, 1927	Conviction. ¹
Daignault, Arthur	Turners Falls	Greenfield	Dec. 14, 1926	Conviction.
Duggan, William	Taunton	Taunton	Dec. 22, 1926	Conviction.
Ferraris, Hannibal	Everett	Malden	Feb. 11, 1927	Conviction.
Fitzgerald, Andrew	Marlboro	Marlboro	Jan. 27, 1927	Conviction.
Gilbroord, Israel	Lawrence	Lawrence	Nov. 11, 1927	Conviction.
Golaszewski, Julian	Millers Falls	Greenfield	Dec. 14, 1926	Conviction.
Gold, David	Springfield	Springfield	Mar. 30, 1927	Conviction.
Gold, David	Springfield	Springfield	Mar. 30, 1927	Conviction.
Gouveia, Robert	New Bedford	New Bedford	Feb. 4, 1927	Conviction.
Huller, Leo	Cambridge	Cambridge	Jan. 18, 1927	Conviction.
Hollis, Frank S.	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Hume, James	Arlington	Cambridge	Jan. 18, 1927	Conviction.
Jacobson, Max	Holyoke	Holyoke	Jan. 7, 1927	Conviction.
Karp, Hyman	Worcester	Worcester	Dec. 2, 1926	Conviction.
Kilduff, Thomas M.	Roxbury	Roxbury	Mar. 11, 1927	Conviction.
Koch, Gottlieb	Turners Falls	Greenfield	Dec. 14, 1926	Conviction.
Koulouris, John	Springfield	Springfield	Dec. 23, 1926	Conviction.
Larivere, Ernest L.	New Bedford	New Bedford	Jan. 20, 1927	Conviction.
Lenaren, Michael	Holyoke	Holyoke	Jan. 6, 1927	Conviction.
Levesque, Arthur J.	Fall River	Fall River	Dec. 14, 1926	Conviction.
Lombara, Albert	Lynn	Lynn	Feb. 24, 1927	Conviction.
Malinski, Stanley	Fall River	Fall River	Dec. 14, 1926	Conviction.
Mathieu, George L.	Turners Falls	Greenfield	Dec. 14, 1926	Conviction.
Morse, Abe	Roxbury	Roxbury	Jan. 19, 1927	Conviction.
Moses, Hormespas	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Moura, John	New Bedford	New Bedford	Feb. 4, 1927	Conviction.
Palmer, Samuel	Haverhill	Haverhill	Dec. 28, 1926	Conviction. ¹
Pandiscio, Rocco	Fitchburg	Fitchburg	Jan. 7, 1927	Conviction.
Panitch, Abraham J	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Pasciak, Jacob	Lowell	Lowell	Dec. 20, 1926	Conviction.
Patrick, Samuel	Lawrence	Lawrence	Dec. 17, 1926	Conviction.
Peach, Robert	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Peribolas, Elias	Springfield	Springfield	Dec. 23, 1926	Conviction.

¹ Appealed.

*For Violation of the Laws relative to Cold Storage — Concluded.*SELLING COLD STORAGE EGGS WITHOUT MARKING THE CONTAINER — *Concluded.*

Persky, Hyman	Holyoke	Holyoke	Nov. 9, 1927	Conviction.
Persky, Robert	Holyoke	Holyoke	Jan. 6, 1927	Conviction.
Pollen, Jacob	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Popko, Andrei	Millers Falls	Greenfield	Dec. 14, 1926	Conviction.
Pothier, Wilfred	Northampton	Northampton	Jan. 20, 1927	Conviction.
Poulos, Vansilis	Brockton	Brockton	Jan. 15, 1927	Conviction.
Preuch, Albert	Turners Falls	Greenfield	Dec. 14, 1926	Conviction.
Price, Abel S.	South Boston	South Boston	Feb. 14, 1927	Conviction.
Promissell, Louis	Chelsea	Chelsea	Jan. 31, 1927	Conviction.
Puritan Grocery Stores, Inc.	New Bedford	New Bedford	Jan. 26, 1927	Conviction.
Rapnodel, Manuel F.	Fall River	Fall River	Dec. 14, 1926	Conviction.
Rind, Leo	South Boston	South Boston	Feb. 14, 1927	Conviction.
Risner, Morris	Boston	Roxbury	Jan. 7, 1927	Conviction.
Russell, Morris	Boston	Roxbury	Jan. 11, 1927	Conviction.
Samia, Albert	Lawrence	Lawrence	Dec. 17, 1926	Conviction.
Scepasisky, Harry	Roxbury	Roxbury	Feb. 14, 1927	Conviction.
Schein, Joseph	Taunton	Taunton	Dec. 22, 1926	Conviction.
Schuhle, Martin	Turners Falls	Greenfield	Dec. 14, 1926	Conviction.
Simpson, Frank	Methuen	Lawrence	Dec. 17, 1926	Conviction.
Singer, Mallie	Boston	Roxbury	Jan. 11, 1927	Conviction.
Smith, George	Marlboro	Marlboro	Jan. 27, 1927	Conviction.
Solomon, David	Turners Falls	Greenfield	Dec. 14, 1926	Conviction.
Sushel, Bernard	Salem	Salem	Jan. 14, 1927	Conviction.
Talbot, Victorian	Fall River	Fall River	Dec. 14, 1926	Conviction.
Tobin, Harry	Roxbury	Roxbury	Feb. 14, 1927	Conviction.
Uksanish, John	Worcester	Worcester	Dec. 2, 1926	Conviction.
Varros, Peter	Brockton	Brockton	Jan. 10, 1927	Conviction.
Venetias, George	New Bedford	New Bedford	Feb. 25, 1927	Conviction.
Whitman, Moses	Worcester	Worcester	Dec. 2, 1926	Conviction.
Winer Company, H.	Roxbury	Roxbury	Jan. 11, 1927	Conviction.
Winer Company, H.	Chelsea	Chelsea	Jan. 21, 1927	Conviction.
Winer & Company, H.	Roxbury	Roxbury	Mar. 11, 1927	Conviction.
Winer Company, M.	Cambridge	Cambridge	Jan. 18, 1927	Conviction.
Wysocki, Charles	Northampton	Northampton	Jan. 20, 1927	Conviction.
Yazbeck, George	Lawrence	Lawrence	Nov. 18, 1927	Conviction.
Zaia, Gastino	Everett	Malden	Feb. 11, 1927	Conviction.

REPRESENTING COLD STORAGE FOOD AS FRESH FOOD.

Gold, David	Springfield	Springfield	Mar. 30, 1927	Conviction.
Gold, David	Springfield	Springfield	Mar. 30, 1927	Conviction.

For Violation of the Laws relative to Slaughtering.

SLAUGHTERING WITHOUT LICENSE.

Ullrich, Reinhold	Pittsfield	Pittsfield	Sept. 2, 1927	Conviction.
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SLAUGHTERING OR AUTHORIZING SLAUGHTERING IN THE ABSENCE OF INSPECTOR.

Barnoff, Benjamin	Sandisfield	Great Barrington	June 15, 1927	Conviction.
Katz, Joseph	North Adams	North Adams	June 2, 1927	Conviction.
King, Arthur	Sutton	Worcester	Jan. 26, 1927	Conviction.
King, Arthur	Sutton	Worcester	Jan. 26, 1927	Conviction.
Konkol, Karl	Auburn	Worcester	Aug. 19, 1927	Conviction.
Walker, William	Harwich	Harwich	Feb. 18, 1927	Conviction.

SELLING, OFFERING FOR SALE, OR HAVING IN POSSESSION WITH INTENT TO SELL, UNSTAMPED MEAT.

Ptak, W.	Housatonic	Great Barrington	Feb. 25, 1927	Conviction.
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SELLING, OFFERING FOR SALE, OR HAVING IN POSSESSION WITH INTENT TO SELL, DECOMPOSED MEAT.				
Garbatsky, Abraham	New Bedford	New Bedford	Nov. 29, 1927	Conviction. ¹

AUTHORIZING SALE OF DISEASED MEAT.

King, Arthur	Sutton	Worcester	Jan. 26, 1927	Conviction.
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FOR SALE OF DISEASED MEAT.

Cohen, David	Worcester	Worcester	Jan. 26, 1927	Discharged.
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AS INSPECTOR OF SLAUGHTERING VIOLATED THE REGULATIONS OF THE DEPARTMENT.

Hough, Charles A.	Sutton	Worcester	Jan. 26, 1927	Discharged.
Spring, Howard	Sandisfield	Great Barrington	June 3, 1927	Conviction.
Taylor, Charles H.	Harwich	Harwich	Feb. 18, 1927	Conviction.

For Violation of the Sanitary Food Law.

Atlantic Bottling Company	Hull	Hingham	Dec. 7, 1926	Conviction. ¹
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For Violation of the Soft Drink Law.

Atlantic Bottling Company	Hull	Hingham	Dec. 7, 1926	Conviction. ¹
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For Violation of the Mattress Laws.

Eastern Mattress & Bed Spring Company	Lowell	Lowell	Mar. 15, 1927	Conviction. ¹
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Obstruction of an Inspector.

Busby, Roy W.	Great Barrington	Great Barrington	June 15, 1927	Discharged.
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¹ Appealed.

TABLE 2. — *Summary of Milk Statistics.*

	TOTAL SAMPLES				SAMPLES FOUND NOT ADULTERATED.			
	Number of Samples.	AVERAGE.			Number of Samples.	AVERAGE.		
		% Total Solids.	% Fat.	% Solids not Fat.		% Total Solids.	% Fat.	% Solids not Fat.
December	295	12.52	3.74	8.78	287	12.56	3.78	8.78
January	291	12.52	3.74	8.78	288	12.53	3.75	8.78
February	364	12.42	3.72	8.70	354	12.45	3.75	8.70
March	1,066	12.42	3.79	8.63	1,000	12.50	3.84	8.66
April	789	12.28	3.80	8.48	759	12.33	3.83	8.50
May	815	12.48	3.69	8.79	796	12.52	3.72	8.80
June	777	12.42	3.65	8.77	756	12.45	3.68	8.77
July	748	12.35	3.69	8.66	706	12.41	3.73	8.68
August	592	12.26	3.71	8.55	553	12.43	3.79	8.64
September	677	12.22	3.67	8.54	650	12.27	3.71	8.56
October	591	12.37	3.70	8.67	561	12.42	3.72	8.70
November	543	12.41	3.68	8.73	500	12.53	3.74	8.79
Total Averages	7,548	12.38	3.72	8.66	7,210	12.45	3.76	8.68

TABLE 3. — *Summary of Milk Samples Examined.*

	NUMBER OF SAMPLES.					PER CENT TOTAL SOLIDS.								
	Above Standard.	Below Standard.	Total.	Cream Removed.	Watered.	15	14	13	12	11	10	9	8	Below 8
December	262	33	295	7	1	1	3	39	219	29	4	—	—	—
January	257	34	291	3	—	1	3	33	220	31	3	—	—	—
February	301	63	364	10	—	1	3	45	252	60	3	—	—	—
March	831	235	1,066	33	33	6	28	167	630	211	23	1	—	—
April	622	167	789	12	18	5	16	87	514	148	15	2	—	—
May	697	118	815	14	5	2	7	128	560	108	8	1	—	1
June	642	135	777	18	3	—	11	95	536	123	11	1	—	—
July	540	208	748	27	15	12	23	80	425	182	22	4	—	—
August	402	190	592	18	21	4	12	76	310	156	29	5	—	—
September	497	180	677	12	15	8	8	54	427	165	14	—	1	—
October	450	141	591	6	24	2	6	74	368	131	10	—	—	—
November	460	83	543	20	23	3	9	55	393	68	14	1	—	—
Totals	5,961	1,587	7,548	180	158	45	129	933	4,854	1,412	156	15	1	3

TABLE 4. — *Food Samples collected during 1927.*

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Butter	79	22	101
Canned Goods	2	—	2
Cereal	1	—	1
Cider	6	1	7
Clams	3	6	9
Cocoanut Oil	1	—	1
Confectionery	6	—	6
Cream	80	15	95
Dried Fruits	4	6	10
Eggs	129	187	316
Evaporated Milk	10	—	10
Flavoring Extracts	1	—	1
Honey	1	—	1
Ice Cream	42	5	47
Lard	1	—	1
Maple Sugar	19	4	23
Maple Syrup	46	87	133
Meat Products:			
Bologna	1	—	1
Frankforts	3	—	3
Hamburg	89	29	118
Kiszki	—	2	2
Mince Meat	2	1	3
Sausage	664	67	731
Nuts	33	11	44
Olive Oil	7	1	8
Oranges	69	2	71
Orange Juice	1	—	1
Oysters	—	2	2
Proprietary Foods	1	—	1
Scallops	10	2	12
Seasonings	1	—	1
Smoked Fish	3	—	3
Smoked Salmon	2	5	7
Soft Drinks	58	4	62
Vinegar	10	1	11
Totals	1,385	460	1,845

TABLE 5. — *Drug Samples collected during 1927.*

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Camphorated Oil	1	—	1
Citrate of Magnesia	1	—	1
Diluted Acetic Acid	10	5	15
Hamamelis Water	1	—	1
Hydrogen Dioxide	2	—	2
Lime Water	27	5	32
Prescription	1	—	1
Proprietary Drug	1	—	1
Spirit of Camphor	5	—	5
Spirit of Nitrous Ether	45	28	73
Syrup of Squill	33	3	36
Tincture of Iodine	1	—	1
Totals	128	41	169

TABLE 6. — *Summary of Liquor Samples examined during 1927.*

CITIES AND TOWNS.	Beer.	Cider.	Wine.	Dis- tilled Spirits.	Ex- tracts.	Alco- hol.	Miscel- laneous.	Total 1927.	Total 1926.
Arlington	6	—	1	17	—	7	—	31	37
Beverly	7	—	9	5	—	5	—	26	42
Boston	252	—	197	1,527	3	376	143	2,498	2,424
Cambridge	65	1	50	261	—	34	20	431	570
Chelsea	34	—	6	122	—	5	11	178	29
Chicopee	11	—	—	4	—	—	1	16	21
Clinton	6	—	5	17	1	4	—	33	15
Dedham	2	2	7	13	—	1	1	26	12
East Longmeadow	3	—	20	3	—	—	—	26	—
Everett	6	—	15	60	—	8	—	89	72
Fall River	25	2	9	73	—	1	3	113	166
Fitchburg	66	2	26	25	1	17	2	139	110
Framingham	8	—	12	8	—	—	—	29	21
Gardner	4	—	—	7	—	1	1	13	22
Gloucester	10	—	16	30	—	21	5	82	101
Haverhill	35	3	18	4	—	5	2	67	90
Holyoke	3	—	—	—	—	—	—	3	23
Lawrence	65	—	12	89	—	27	6	199	241
Leominster	21	2	15	15	1	7	—	61	68
Lowell	486	4	26	273	—	39	74	902	696
Lynn	23	2	32	164	—	56	22	299	355
Malden	74	—	31	327	—	32	11	475	272
Marlboro.	22	—	12	44	—	7	24	109	154
Medford	10	—	—	71	—	6	2	89	52
Melrose	1	—	1	17	—	—	1	20	5
Milford	24	—	27	28	—	2	4	85	40
Newburyport	4	—	2	6	—	—	1	13	35
Newton	3	—	7	13	—	2	2	27	21
North Adams	1	—	—	4	—	1	—	6	4
Northampton	1	—	—	14	—	2	1	18	—
Norwood	5	2	1	13	—	—	—	21	23
Peabody	2	—	—	47	2	2	—	53	65
Pittsfield	15	2	1	10	—	2	1	31	36
Quincy	6	—	25	89	—	47	7	174	66
Revere	29	—	24	26	—	7	—	86	68
Rockland	7	—	6	10	—	3	4	30	20
Salem	33	—	27	36	—	39	2	137	111
Salisbury	6	—	2	7	—	—	1	20	30
Somerville	13	—	4	81	—	6	—	104	64
Southbridge	14	—	—	11	—	3	—	28	11
Springfield	96	3	63	222	—	11	11	406	352
Stoughton	2	—	—	18	—	4	—	24	30
Taunton	25	—	4	21	—	1	2	53	69
Wakefield	6	—	11	25	—	6	4	52	83
Walpole	4	—	23	17	—	10	7	61	77
Waltham	7	—	7	28	—	8	8	58	63
Watertown	6	—	12	19	—	—	—	37	39
Webster	10	—	3	16	—	—	1	30	20
Weymouth	23	1	2	25	—	6	—	57	14
Whately	9	2	2	7	—	1	—	21	6
Woburn	2	—	4	24	—	5	—	35	40
Department of Public Safety	165	35	67	252	—	36	25	580	919
Met. Dist. Comm.	7	—	6	9	—	1	1	24	—
Miscellaneous ¹	159	21	59	275	—	66	10	590	—
Totals	1,929	84	909	4,529	8	935	421	8,815	7,904

¹ Ninety-four towns submitted less than 20 samples and the Board of Registration in Pharmacy submitted 590 samples.

TABLE 7. — Articles Other than Fish placed in Cold Storage from December 1, 1926, to December 1, 1927.

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
December	752,130	602,430	193,507	166,694	1,944,538	735,752	1,279,860	485,050	456,985	2,412,523	274,124	902,281
January	486,997	411,000	414,334	55,085	927,888	373,525	367,907	283,429	203,429	3,169,613	90,544	794,966
February	647,341	166,440	186,774	42,687	204,582	128,465	73,720	354,616	510,856	2,516,652	34,800	692,479
March	337,011	2,301,160	570,247	26,521	275,689	138,349	29,349	190,881	127,578	1,689,514	10,390	789,037
April	200,032	3,290,340	1,356,348	44,514	353,653	142,899	36,728	243,769	837,348	1,345,055	36,734	808,365
May	2,058,038	4,930,170	888,724	61,038	490,932	134,603	50,806	379,352	318,939	1,463,387	46,484	683,192
June	7,643,882	3,415,960	677,752	187,392	324,440	341,957	29,486	487,267	1,014,747	2,394,061½	101,238	1,077,568
July	6,767,521	1,109,370	223,234	143,063	183,558	191,207	7,860	583,250	393,631	2,053,422	44,258	1,051,611
August	4,289,786	1,301,320	312,141	239,054	144,396	118,753	45,539	314,943½	184,106	1,271,758	15,864	1,032,539
September	1,901,341	610,950	132,017	299,163	215,822	150,392	16,726	287,874	248,817	1,770,004	45,340	1,124,301
October	1,078,752	385,380	282,506	203,055	442,504	165,465	78,656	192,055	257,800	1,191,826	78,493	976,706
November	742,200	358,950	333,913	231,440	982,279	396,346	451,675½	350,812½	793,178	962,295	176,020	1,183,757

TABLE 8. — Fish placed in Cold Storage from December 15, 1926, to December 15, 1927.

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall and Silver Salmon (Pounds).	Salmon, all Others (Pounds).	Shad (Pounds).	Smelts, Eula- chon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish (Pounds).
January	—	17,107	999	6,493	252,997	300,494	78,155	102,771	144,386	—	70,854	331,890	14,924	512,025	431,722
February	—	—	4,667	123,225	395,388	117,200	27,815	138,289	39,377	500	326,615	488,124	195	640,531	136,940
March	—	13,193	—	137,665	109,914	563,770	32	14,550	534	1,340	201,871	689,177	—	458,932	58,805
April	—	—	8,475	55,835	24,954	385,245	67,577	55,611	22,257	1,725	7,901	323,379	556	243,375	37,379
May	—	1,284	3,058	37,894	164,734	1,105,248	646,801	12,557	2,288	16,047	3,546	77,482	180	1,897	115,915
June	—	—	127,493	9,618	1,177,643	978,181	67,878	600	9,090	5,641	—	312,941	30	891,859	263,468
July	300	8,152	410	196,835	53,590	76,778	1,177,371	7,132	56,407	1,282	—	203,617	150	775,619	211,517
August	500	50,048	8,690	220,923	28,453	167,380	1,667,213	1,355	14,730	730	230	402,869	284	2,086,260	532,118
September	860	32,146	2,700	633,925	13,248	712,000	549,185	2,806	5,432	5,038	—	263,600	284	1,122,806	621,849
October	200	19,526	15,570	705,762	53,376	277,212	277,212	18,409	14,303	—	310	482,966	—	1,027,265	171,003
November	—	—	17,473	344,965	201,170	427,848	200,756	32,225	50,701	120	4,460	509,893	535	796,016	254,671
December	—	2,857	17,957	201,231	604,658	426,028	164,121	149,513	106,900	—	3,350	290,048	350	156,394	224,075

TABLE 9. — Articles Other than Fish on Hand in Cold Storage on the First Day of the Month, from January 1, 1927, through December 1, 1927.

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
January	5,326,940	1,925,270	1,251,603	1,245,573	4,757,619	1,403,970	1,125,770	1,076,100	1,847,772	3,947,372	703,366	2,290,732
February	2,312,417	624,420	1,160,898	1,067,242	5,253,883	1,584,051	1,350,177	1,103,056	1,652,021	6,331,200	744,704	2,320,496
March	907,459	162,780	954,018	1,061,915	4,752,313	1,436,734	1,288,332	1,228,877	1,817,308	7,695,461	721,157	2,243,512
April	370,865	2,143,620	1,188,006	810,358	3,928,399	1,025,313	1,215,302	957,637	1,315,501	8,390,020	508,105	2,333,321
May	130,495	7,442,910	2,200,589	656,702	3,162,689	370,250	1,081,254	780,498	1,637,681	7,654,696	312,494	2,333,202
June	1,891,707	11,659,860	2,682,123	561,744	2,633,343	245,206	1,030,532	1,058,515	1,481,564	8,065,514	169,443	2,290,539
July	8,891,440	14,292,030	2,842,610	503,920	2,039,005	433,337	919,698	1,057,685	2,032,505	8,943,691	219,985	2,584,940
August	14,665,427	14,320,980	2,697,193	486,467	1,499,962	463,790	809,128	1,324,114	1,970,854	9,352,234	213,253	3,025,518
September	16,894,959	12,752,430	2,495,421	575,465	1,795,896	343,304	715,572	1,270,434	1,590,441	8,278,466	173,202	2,911,729
October	18,502,093	10,685,280	2,084,450	776,818	562,139	302,024	623,723	1,310,044	1,564,217	6,272,641	194,973	2,984,039
November	12,772,803	7,738,670	1,797,653	883,667	751,084	231,674	558,512	1,375,622	1,554,514	4,009,177	238,449	2,307,995
December	8,941,984	4,306,770	1,550,770	1,041,066	1,591,589	502,436	723,403	1,510,571	2,176,673	3,057,966	385,774	2,579,949

TABLE 10. — Fish on Hand in Cold Storage on the Fifteenth Day of the Month, from January 15, 1927, through December 15, 1927.

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Hallbut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall and Silver Salmon (Pounds).	Salmon, all Others (Pounds).	Shad (Pounds).	Smelts, Eulach- ion, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish (Pounds).
January	3,745	150,592	15,451	950,673	401,107	803,699	4,411,972	134,126	155,082	2,092	81,707	1,266,512	13,153	3,262,340	879,126
February	3,745	110,458	3,647	816,618	525,128	565,562	3,312,345	204,699	148,563	1,790	359,829	1,090,554	6,949	1,679,195	735,353
March	3,455	74,348	1,272	583,535	388,051	664,971	2,005,462	138,085	109,720	1,555	430,588	945,183	3,348	347,796	502,035
April	2,842	25,768	944	152,891	296,088	593,027	576,434	96,131	75,885	624	201,301	690,685	—	21,063	326,085
May	2,945	26,469	2,392	125,614	409,475	1,224,573	944,368	37,489	32,937	4,426	175,236	598,010	180	480	332,333
June	2,153	3,057	2,392	198,845	403,911	2,006,223	1,739,555	33,098	74,197	9,710	159,077	823,885	210	857,057	599,371
July	2,943	11,104	2,692	484,094	432,132	1,004,427	2,434,960	25,419	33,793	10,597	152,360	943,954	210	1,468,570	696,271
August	2,748	61,042	5,995	580,915	473,650	1,511,924	4,433,142	25,419	77,913	10,555	149,690	823,885	564	3,396,755	1,195,651
September	3,425	90,278	4,677	1,122,172	480,389	1,781,683	4,654,139	27,386	77,724	13,943	145,132	1,159,041	564	3,761,296	1,684,618
October	2,312	109,056	13,619	1,745,744	502,705	2,057,426	4,433,142	42,831	82,611	12,918	136,325	1,343,669	564	3,696,720	1,629,443
November	2,312	84,457	22,571	1,546,506	555,977	1,993,911	1,967,888	61,278	109,897	8,560	121,320	1,267,146	960	3,444,645	1,332,618
December	2,130	64,058	29,654	1,070,753	941,390	1,830,086	1,967,132	166,712	181,577	6,540	57,870	1,110,129	910	2,745,826	1,235,077

Summary.

Requests for extension of time granted	206
Eggs	5
Poultry	40
Game	1
Meat	30
Fish	130
Requests for extension of time not granted	16
Poultry	6
Meat	2
Fish	8
Articles ordered removed from storage (no requests made)	63
Eggs	1
Poultry	24
Game	2
Meat	8
Fish	28

TABLE 11. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1926, to December 1, 1927.*

[Reason for such extension being that goods were in proper condition for further storage.]

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension Granted to—	Name.
Egg whites	2,772	June 1926	June 30, 1927	Handy, H. L., Co.
Egg whites	2,160	May 31, 1926	July 8, 1927	Lewis, Mears Co.
Egg whites	5,790	June 14, 1926	Sept. 14, 1927	Lewis, Mears Co.
Egg whites	3,000	June 23, 1926	Sept. 23, 1927	Lewis, Mears Co.
Egg whites	1,980	July 3, 1926	Oct. 3, 1927	Lewis, Mears Co.
Capons	2,464	Feb. 3, 1926	Apr. 2, 1927	Radlo Brothers.
Chickens	349	Dec. 29, 1925	Feb. 28, 1927	Alley, Greene & Pipe Co.
Chickens	658	Dec. 29, 1925	Feb. 28, 1927	Alley, Greene & Pipe Co.
Chickens	883	Dec. 29, 1925	Feb. 28, 1927	Alley, Greene & Pipe Co.
Chickens	3,336	Dec. 29, 1925	Feb. 28, 1927	Alley, Greene & Pipe Co.
Chickens	4,252	Dec. 29, 1925	Feb. 28, 1927	Alley, Greene & Pipe Co.
Chickens	3,153	Dec. 30, 1925	Feb. 28, 1927	Alley, Greene & Pipe Co.
Chickens	1,091	Aug. 16, 1926	Jan. 16, 1928	Berman & Co., Inc.
Chickens	1,538	Nov. 30, 1926	Dec. 30, 1927	Berman & Co., Inc.
Chickens	5,262	Dec. 2, 1926	Jan. 1, 1928	Berman & Co., Inc.
Chickens	1,851	Dec. 7, 1926	Jan. 1, 1928	Berman & Co., Inc.
Chickens	1,558	Oct. 23, 1925	Jan. 1, 1927	First National Stores, Inc.
Chickens	2,503	Nov. 16, 1925	Jan. 16, 1927	First National Stores, Inc.
Chickens	835	Jan. 8, 1926	Feb. 8, 1927	First National Stores, Inc.
Chickens	21,719	Dec. 7, 1925	Feb. 7, 1927	Hosmer, F. H., & Co.
Chickens	1,380	Dec. 11, 1925	Feb. 11, 1927	Hosmer, F. H., & Co.
Chickens	5,996	Dec. 11, 1925	Feb. 11, 1927	Hosmer, F. H., & Co.
Chickens	1,968	Dec. 29, 1925	Feb. 28, 1927	Hosmer, F. H., & Co.
Chickens	1,728	Dec. 30, 1925	Feb. 28, 1927	Hosmer, F. H., & Co.
Chickens	1,741	Dec. 30, 1925	Feb. 28, 1927	Hosmer, F. H., & Co.
Chickens	2,256	Dec. 30, 1925	Feb. 28, 1927	Hosmer, F. H., & Co.
Chickens	2,640	Dec. 30, 1925	Feb. 28, 1927	Hosmer, F. H., & Co.
Chickens	247	Dec. 7, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	1,332	Dec. 7, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	2,651	Dec. 7, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	2,775	Dec. 7, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	782	Dec. 11, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	1,857	Dec. 11, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	2,975	Dec. 11, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	7,586	Dec. 11, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	692	Dec. 14, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	827	Dec. 14, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	882	Dec. 14, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	1,160	Dec. 14, 1925	Feb. 15, 1927	Lamson & Co.
Chickens	1,158	Aug. 24, 1926	Nov. 23, 1927	Mentzer, A. F., & Co.
Chickens	281	Sept. 18, 1926	Nov. 17, 1927	Mentzer, A. F., & Co.
Chickens	1,398	Dec. 28, 1925	Feb. 28, 1927	Pratt, F. B., Co.
Chickens	203	Nov. 10, 1926	Jan. 26, 1928	Weston-Thurston Co.
Chickens	122	Nov. 20, 1926	Jan. 26, 1928	Weston-Thurston Co.
Fowl	6,975	Mar. 10, 1926	May 10, 1927	Hosmer, F. H., & Co.
Venison	96	Nov. 27, 1926	Feb. 1, 1928	Davis, Fred E.
Beef	4,733	Jan. 19, 1926	Feb. 19, 1927	Berger & Tackeff.
Beef	1,261	Dec. 21, 1925	Jan. 21, 1927	First National Stores, Inc.
Beef	2,695	June 5, 1926	Sept. 16, 1927	MacLoud, George H.
Beef	27,493	Nov. 15, 1926	Jan. 1, 1928	New England Dressed Meat and Wool Co.
Beef	3,562	Nov. 19, 1926	Jan. 1, 1928	New England Dressed Meat and Wool Co.
Beef	10,252	Nov. 26, 1926	Jan. 1, 1928	New England Dressed Meat and Wool Co.

¹ Imported, original date of storage unknown.

TABLE 11. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1926, to December 1, 1927. — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension Granted to —	Name.
Beef loins	853	May 14, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	631	May 15, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	348	May 19, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	548	May 21, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	852	May 25, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	221	May 26, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	486	June 4, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	1,494	June 11, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef loins	870	Mar. 27, 1926	May 27, 1927	Armour & Co.
Beef loins	983	Apr. 10, 1926	June 10, 1927	Armour & Co.
Beef loins	482	May 11, 1926	July 30, 1927	Fletcher, J. V., Co.
Beef loins	1,292	May 11, 1926	July 30, 1927	Fletcher, J. V., Co.
Beef loins	1,358	May 12, 1926	July 30, 1927	Fletcher, J. V., Co.
Beef loins	754	May 19, 1926	July 30, 1927	Fletcher, J. V., Co.
Beef loins	828	May 19, 1926	July 30, 1927	Fletcher, J. V., Co.
Beef loins	6,468	May 17, 1926	July 16, 1927	Pineo Brothers, Inc.
Beef ribs	181	May 19, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef ribs	193	May 26, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef ribs	173	May 27, 1926	Aug. 1, 1927	Andrews & Pierce, Inc.
Beef ribs	461	Mar. 27, 1926	May 27, 1927	Armour & Co.
Beef ribs	302	Apr. 10, 1926	June 10, 1927	Armour & Co.
Beef ribs	689	June 11, 1926	July 30, 1927	Fletcher, J. V., Co.
Beef tenderloins	2,023	Apr. 26, 1926 ¹	June 30, 1927	New England Dressed Meat and Wool Co.
Beef tenderloins	3,659	May 22, 1926 ¹	June 30, 1927	New England Dressed Meat and Wool Co.
Butterfish	600	Sept. 11, 1926	Dec. 11, 1927	Russo & Sons.
Cod	4,436	Oct. 5, 1926	Jan. 5, 1928	Whitman, Ward & Lee Co.
Flounders	52,991	May 12, 1926	Dec. 30, 1927	Provincetown Cold Storage Co.
Flounders	2,000	Sept. 10, 1926	Nov. 10, 1927	Spivak, Barney.
Halibut	816	June 30, 1926	Dec. 30, 1927	Arnold & Winsor Co.
Halibut	14,700	Oct. 11, 1926	Apr. 11, 1928	Atlantic Halibut Co.
Halibut	12,852	Nov. 6, 1926	Mar. 6, 1928	Atlantic Halibut Co.
Halibut	14,291	Nov. 6, 1926	Mar. 6, 1928	Atlantic Halibut Co.
Halibut	6,000	Nov. 12, 1926	Mar. 12, 1928	Atlantic Halibut Co.
Halibut	9,074	Nov. 18, 1926	Mar. 18, 1928	Atlantic Halibut Co.
Halibut	14,900	Nov. 18, 1926	Mar. 18, 1928	Atlantic Halibut Co.
Halibut	1,840	July 1, 1926	Dec. 1, 1927	Best Fish Co., The.
Halibut	2,518	June 10, 1926	Dec. 10, 1927	Burns-McKeon Co.
Halibut	380	Aug. 18, 1926	Dec. 18, 1927	Burns-McKeon Co.
Halibut	1,984	Oct. 15, 1926	Jan. 1, 1928	Burns-McKeon Co.
Halibut	1,400	Nov. 5, 1926	Mar. 5, 1928	Burns-McKeon Co.
Halibut	200	Sept. 17, 1926	Dec. 17, 1927	Fulham & Herbert.
Halibut	270	Oct. 1, 1926	Dec. 31, 1927	Harding, F. E., & Co.
Halibut	140	Oct. 9, 1926	Dec. 31, 1927	Harding, F. E., & Co.
Halibut	255	Oct. 9, 1926	Dec. 31, 1927	Harding, F. E., & Co.
Halibut	700	May 8, 1926	Dec. 1, 1927	Hunt, Cassius, & Co.
Halibut	5,200	May 11, 1926	Dec. 1, 1927	Hunt, Cassius, & Co.
Halibut	800	June 11, 1926	Dec. 11, 1927	Neal, John R., Co.
Halibut	409	July 16, 1926	Jan. 15, 1928	Neal, John R., Co.
Halibut	1,580	May 5, 1926	Dec. 1, 1927	New England Fish Co.
Halibut	2,550	May 12, 1926	Dec. 1, 1927	New England Fish Co.
Halibut	1,500	May 18, 1926	Dec. 1, 1927	New England Fish Co.
Halibut	6,970	June 16, 1926	Dec. 16, 1927	New England Fish Co.
Halibut	24,700	Aug. 12, 1926	Dec. 12, 1927	New England Fish Co.
Halibut	10,400	Aug. 13, 1926	Dec. 13, 1927	New England Fish Co.
Halibut	2,200	Aug. 17, 1926	Dec. 17, 1927	New England Fish Co.
Halibut	2,275	Aug. 17, 1926	Dec. 17, 1927	New England Fish Co.
Halibut	1,200	Oct. 6, 1926	Mar. 6, 1928	New England Fish Co.
Halibut	6,200	Oct. 6, 1926	Mar. 6, 1928	New England Fish Co.
Halibut	23,726	Oct. 6, 1926	Mar. 6, 1928	New England Fish Co.
Halibut	25,927	Nov. 8, 1926	Mar. 8, 1928	New England Fish Co.
Halibut	700	July 29, 1926	Nov. 29, 1927	Pier Fish Co.
Halibut	1,171	Oct. 15, 1926	Feb. 15, 1928	Prior & Townsend, Inc.
Halibut	957	Oct. 15, 1926	Jan. 1, 1928	Rich, Joseph A., Co.
Halibut	400	Oct. 15, 1926	Jan. 1, 1928	Standard Fish Co.
Halibut	12,747	Aug. 15, 1926	Dec. 15, 1927	Whitman, Ward & Lee Co.
Halibut	3,900	Sept. 13, 1926	Dec. 13, 1927	Whitman, Ward & Lee Co.
Herring	1,400	June 20, 1926	Dec. 1, 1927	Fitch, Warren, Co.
Mackerel	5,770	Aug. 20, 1926	Nov. 20, 1927	Adams, J., & Co.
Mackerel	1,500	Aug. 28, 1926	Nov. 28, 1927	Adams, J., & Co.
Mackerel	3,000	Sept. 3, 1926	Dec. 3, 1927	Adams, J., & Co.
Mackerel	2,100	July 17, 1926	Jan. 1, 1928	Anderson, C. F.
Mackerel	760	July 15, 1926	Dec. 1, 1927	Atlantic & Pacific Fish Co.
Mackerel	3,220	July 15, 1926	Dec. 1, 1927	Atlantic & Pacific Fish Co.
Mackerel	1,192	July 2, 1926	Oct. 2, 1927	Banks Fish Market.
Mackerel	11,552	June 14, 1926	Oct. 14, 1927	Batchelder & Snyder Co.
Mackerel	5,284	July 2, 1926	Nov. 2, 1927	Batchelder & Snyder Co.
Mackerel ²	1,390	June 14, 1926	Dec. 14, 1927	Burns-McKeon Co.
Mackerel ²	4,300	June 14, 1926	Dec. 13, 1927	Burns-McKeon Co.
Mackerel	2,000	June 16, 1926	Dec. 15, 1927	Burns-McKeon Co.
Mackerel	2,650	June 17, 1926	Dec. 17, 1927	Burns-McKeon Co.
Mackerel	3,900	June 17, 1926	Dec. 17, 1927	Burns-McKeon Co.
Mackerel ²	3,450	June 22, 1926	Dec. 21, 1927	Burns-McKeon Co.

¹ Imported, original date of storage unknown.² Bait.

TABLE 11. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1926, to December 1, 1927 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension Granted to —	Name.
Mackerel	6,500	June 25, 1926	Dec. 25, 1927	Burns-McKeon Co.
Mackerel	1,600	July 27, 1926	Jan. 27, 1928	Burns-McKeon Co.
Mackerel	4,300	Sept. 7, 1926	Dec. 7, 1927	Burns-McKeon Co.
Mackerel	3,775	Oct. 5, 1926	Jan. 1, 1928	Burns-McKeon Co.
Mackerel ¹	650	June 27, 1926	Jan. 1, 1928	Dennis, Joseph K.
Mackerel	292	July 2, 1926	Jan. 1, 1928	Dennis, Joseph K.
Mackerel	6,056	June 14, 1926	Nov. 6, 1927	Doe, William A., Co.
Mackerel	6,248	June 28, 1926	Dec. 1, 1927	Fitch, Warren, Co.
Mackerel	6,172	June 14, 1926	Sept. 14, 1927	Foley, M. F., Co.
Mackerel	2,482	June 17, 1927	Sept. 16, 1927	Foley, M. F., Co.
Mackerel	1,260	July 15, 1926	Oct. 14, 1927	Foley, M. F., Co.
Mackerel	4,200	Sept. 9, 1926	Dec. 7, 1927	Hamele, H. W.
Mackerel	1,400	July 7, 1926	Nov. 8, 1927	Jamaica Plain Market.
Mackerel	2,400	June 19, 1926	Nov. 15, 1927	Kashman, J., & Son.
Mackerel	1,580	June 14, 1926	Dec. 14, 1927	Malone, E. A.
Mackerel ¹	420	June 21, 1926	Dec. 21, 1927	Malone, E. A.
Mackerel	1,750	June 21, 1926	Dec. 21, 1927	Malone, E. A.
Mackerel	1,925	June 28, 1926	Dec. 28, 1927	Malone, E. A.
Mackerel	300	Aug. 9, 1926	Dec. 9, 1927	Nagle, John, & Co.
Mackerel	1,950	Apr. 14, 1927 ²	Dec. 1, 1927	National Seasealed Fillets Inc.
Mackerel	3,800	Apr. 14, 1927 ²	Dec. 1, 1927	National Seasealed Fillets Inc.
Mackerel	1,576	Aug. 27, 1926	Feb. 27, 1928	Neal, John R., Co.
Mackerel	3,800	Aug. 21, 1926	Dec. 1, 1927	New Britain Fish Market Inc.
Mackerel	—	July 28, 1926	Dec. 31, 1927	O'Brien, R., & Co.
Mackerel	2,824	July 8, 1926	Dec. 20, 1927	O'Hara Brothers Co., Inc.
Mackerel	20,030	July 13, 1926	Dec. 13, 1927	O'Hara Brothers Co., Inc.
Mackerel	4,800	July 14, 1926	Dec. 15, 1927	O'Hara Brothers Co., Inc.
Mackerel	8,254	July 14, 1926	Dec. 15, 1927	O'Hara Brothers Co., Inc.
Mackerel	15,000	July 14, 1926	Dec. 14, 1927	O'Hara Brothers Co., Inc.
Mackerel	18,750	July 15, 1926	Dec. 15, 1927	O'Hara Brothers Co., Inc.
Mackerel	805	July 7, 1926	Jan. 7, 1928	Pier Fish Co.
Mackerel	4,970	July 9, 1926	Jan. 8, 1928	Pier Fish Co.
Mackerel	2,555	July 13, 1926	Jan. 13, 1928	Pier Fish Co.
Mackerel	245	Aug. 1, 1926	Dec. 1, 1927	Pier Fish Co.
Mackerel	1,960	Aug. 2, 1926	Dec. 1, 1927	Pier Fish Co.
Mackerel	490	Aug. 8, 1926	Dec. 1, 1927	Pier Fish Co.
Mackerel	507	June 4, 1926	Dec. 3, 1927	Richardson, R. B.
Mackerel	1,530	July 17, 1926	Dec. 1, 1927	Snow & Parker, Inc.
Mackerel	675	Aug. 11, 1926	Dec. 11, 1927	Snow & Parker, Inc.
Mackerel	2,100	Aug. 27, 1926	Nov. 27, 1927	Spivak, Barney.
Mackerel	5,056	May 18, 1926	Oct. 1, 1927	Whitman, Ward & Lee Co.
Pollock	2,540	Oct. 14, 1926	Nov. 14, 1927	Palmer Fish Co.
Pollock	500	Oct. 14, 1926	Dec. 14, 1927	Russo & Sons.
Pollock	150	Oct. 28, 1926	Dec. 28, 1927	Russo & Sons.
Salmon	560	June 23, 1926	July 4, 1927	Burns-McKeon Co.
Salmon	500	Oct. 15, 1926	Jan. 1, 1928	Burns-McKeon Co.
Salmon	844	Oct. 20, 1926	Jan. 1, 1928	Burns-McKeon Co.
Salmon, silver	200	Sept. 3, 1926	Jan. 3, 1928	Commonwealth Ice & Cold Storage Co.
Salmon, fall	750	Oct. 15, 1926	Jan. 15, 1928	Foley, M. F., Co.
Salmon, fall	1,750	Oct. 15, 1926	Jan. 15, 1928	Foley, M. F., Co.
Salmon	400	Oct. 10, 1926	Jan. 1, 1928	Henry & Close Co.
Salmon	3,000	Nov. 9, 1926	Jan. 9, 1928	New England Fish Co.
Salmon	250	July 3, 1926	Dec. 1, 1927	O'Brien, R., & Co.
Salmon	500	Oct. 15, 1926	Jan. 15, 1928	O'Hara Brothers Co., Inc.
Salmon	1,800	Oct. 20, 1926	Jan. 1, 1928	Phillips, B. F., & Co.
Salmon	2,210	Oct. 15, 1926	Jan. 15, 1928	Pier Fish Co.
Salmon	1,700	Sept. 3, 1926	Dec. 3, 1927	Whitman, Ward & Lee Co.
Salmon	1,255	Oct. 15, 1926	Jan. 15, 1928	Whitman, Ward & Lee Co.
Salmon	6,100	Oct. 15, 1926	Jan. 15, 1928	Whitman, Ward & Lee Co.
Scallops	40 gal.	Oct. 22, 1926	Jan. 1, 1928	First National Stores, Inc.
Scallops	80 gal.	Oct. 29, 1926	Jan. 1, 1928	First National Stores, Inc.
Scallops	80 gal.	Nov. 1, 1926	Jan. 1, 1928	First National Stores, Inc.
Scallops	28 gal.	Oct. 14, 1926	Jan. 1, 1928	Phillips, B. F., & Co.
Scallops	40 gal.	Nov. 14, 1926	Jan. 1, 1928	Phillips, B. F., & Co.
Sole ¹	2,383	May 22, 1926	Oct. 1, 1927	Gifford, C. H.
Sole ¹	500	June 1, 1926	Oct. 1, 1927	Gifford, C. H.
Sole ¹	738	July 6, 1926	Oct. 1, 1927	Gifford, C. H.
Sole ¹	1,617	July 17, 1926	Oct. 1, 1927	Gifford, C. H.
Sole ¹	724	July 30, 1926	Oct. 1, 1927	Gifford, C. H.
Sole ¹	610	July 31, 1926	Oct. 1, 1927	Gifford, C. H.
Sole	4,500	Feb. 18, 1926	Apr. 1, 1927	Hunt, Cassius, Co.
Sole	50,772	June 15, 1926	Dec. 30, 1927	Provincetown Cold Storage Co.

TABLE 12. — *Requests for Extension of Time not granted on Goods in Cold Storage from December 1, 1926, to December 1, 1927.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Broilers	446	Nov. 2, 1926	Weston-Thurston Co.
Chickens	428	Dec. 30, 1926	Berman & Co., Inc.
Chickens	1,380	—	Lamson & Co.
Chickens	855	Oct. 30, 1925	Lamson & Co.

¹ Bait.² Original date of storage unknown.

TABLE 12. — *Requests for Extension of Time not granted on Goods in Cold Storage from December 1, 1926, to December 1, 1927 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Chickens	843	Nov. 1, 1925	Lamson & Co.
Chickens	5,376	Nov. 14, 1925	Lamson & Co.
Beef loins	48	Apr. 17, 1926	Armour & Co.
Beef loins	55	May 1, 1926	Armour & Co.
Butterfish	490	Aug. 13, 1926	Mantia, S., & Co.
Halibut	560	Aug. 28, 1926	Burns-McKeon Co.
Mackerel	450	June 15, 1926	Snow & Parker, Inc.
Mackerel	320	June 28, 1926	Snow & Parker, Inc.
Salmon	185	Aug. 28, 1926	Burns-McKeon Co.
Salmon	830	Sept. 9, 1926	Burns-McKeon Co.
Salmon	175	Sept. 29, 1926	Burns-McKeon Co.
Salmon	1,750	Aug. 25, 1926	Pier Fish Co.

TABLE 13. — *Articles which had been in Cold Storage longer than Twelve Months and on which no Requests for Extensions had been made, ordered removed from December 1, 1926, to December 1, 1927.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Egg whites	—	— ¹	Titman Egg Co.
Broilers	287	June 18, 1926	Armour & Co.
Broilers	268	June 19, 1926	Armour & Co.
Broilers	64	June 22, 1926	Armour & Co.
Broilers	101	June 25, 1926	Armour & Co.
Broilers	263	June 25, 1926	Armour & Co.
Broilers	75	July 2, 1926	Armour & Co.
Broilers	91	July 2, 1926	Armour & Co.
Capons	157	Dec. 1, 1925	Holmes, Samuel.
Chickens	442	Oct. 30, 1925	Armour & Co.
Chickens	2,218	Nov. 27, 1925	Childs, Sleeper Co.
Chickens	56	Dec. 17, 1925	Childs, Sleeper Co.
Chickens	64	Oct. 30, 1925	Hosmer, F. H., & Co.
Chickens	846	Oct. 30, 1925	Hosmer, F. H., & Co.
Chickens	—	Sept. 28, 1926	Hurley, T. F.
Chickens	80	Aug. 30, 1926	Lawrence, H. L.
Chickens	479	June 17, 1926	Pittsfield Luncheonette.
Chickens	59	Nov. 28, 1925	Quinn, P. F., & Sons.
Chickens	2,629	Oct. 11, 1926	Segall, Jacob.
Chickens	—	Nov. 13, 1925	Wilson & Co.
Fowl	120	July 16, 1926	Burke Brothers.
Poultry	355	Sept. 1, 1926	Arron, Theodore, Co.
Poultry	246	Nov. 5, 1926	Austin, G. M., & Son.
Poultry	72	July 12, 1926	Benson Brothers.
Poultry	—	— ¹	Moulton, Edwin H., Co.
Venison	30	Jan. 8, 1926	Hayes, Raymond.
Venison	62	Dec. 1, 1925	Tichell, Clarence.
Beef	237	Nov. 11, 1926	Massachusetts Industrial School for Girls.
Beef livers	267	May 29, 1926	Brighton Dressed Meat Co.
Beef livers	1,250	Dec. 22, 1925	Munroe-Sexton Co.
Beef ribs	399	May 17, 1926	Pineo Brothers.
Lamb	55	July 1, 1926	Harvard Provision Co.
Lamb fores	450	Feb. 27, 1926	Fletcher, J. V., Co.
Pork loins	100	Nov. 22, 1926	Harvard Provision Co.
Sweetbreads	39	May 25, 1926	Childs, Sleeper Co.
Bass, sea	478	June 4, 1926	First National Stores, Inc.
Bluefish	850	Aug. 31, 1926	First National Stores, Inc.
Bluefish	463	Sept. 4, 1926	First National Stores, Inc.
Butterfish	23,463	May 13, 1926	Bishop & Pannen.
Butterfish	432	Sept. 3, 1926	Freeman & Cobb Co.
Butterfish	105	June 20, 1926	Rowe & Sullivan.
Halibut	229	Sept. 24, 1926	Atlas Fish Co.
Halibut	1,072	Sept. 30, 1926	Burns-McKeon Co.
Halibut	600	Oct. 25, 1925	First National Stores, Inc.
Halibut	214	July 2, 1926	Whitman, Ward & Lee Co.
Herring	600	Apr. 21, 1926 ²	Burns-McKeon Co.
Mackerel	905	Aug. 31, 1926	Arrington, H. R.
Mackerel	1,600	July 9, 1926	Busalacchi Brothers.
Mackerel	284	Sept. 15, 1926	Cape Fish Co.
Mackerel	198	Aug. 19, 1926	Connecticut Cash Market.
Mackerel	400	July 13, 1926	Economy Market.
Mackerel	100	Sept. 15, 1926	O'Brien, R., & Co.
Mackerel	417	July 2, 1926	Saunders' Market.
Mackerel	220	Oct. 8, 1926	Shea & O'Neill.
Salmon	305	Sept. 4, 1926	Atlas Fish Co.
Salmon	325	July 1, 1926	Bay State Smoked Fish Co.
Salmon	83	Aug. 15, 1926	Harding, F. E.
Scallops	36 gal.	Oct. 2, 1926	Arrington, H. R.
Smelts	1,960	Nov. 27, 1925	Mantia, S., Co.
Sole	1,428	May 14, 1926	Smith, J. H., & Co.
Squid	58	Oct. 5, 1926	Catalanotti, G., & Son.
Squid	1,019	Oct. 11, 1926	Nagle, John, Co.
Trout	300	Dec. 24, 1926 ²	Shattuck & Jones.

¹ Original date of storage unknown.² Received frozen and undated.

REPORT OF DIVISION OF COMMUNICABLE DISEASES.

CLARENCE L. SCAMMAN, M.D., *Director*.

FILIP C. FORSBECK, M.D., *Epidemiologist*.

The functions of the division are carried on by (a) an epidemiological staff, (b) a bacteriological staff, (c) a venereal disease staff and (d) a field force of six District Health Officers, who are representatives of the Commissioner in their respective districts, but included in the personnel of the division for administrative purposes.

This year the cases of communicable disease (83,816) show a decrease over the number reported last year (100,375). This decrease has been due almost entirely to a low incidence of measles.

The Minimum Quarantine Requirements adopted in October, 1926, by both the Massachusetts Association of Boards of Health and this Department have been accepted by at least fifty cities and towns in the commonwealth to date. Effort is being made to have all cities and towns adopt these requirements in order that there may be a minimum of variation in quarantine procedures throughout the state.

A short résumé is given herewith of certain communicable diseases as to morbidity, fatality and mortality.

Anterior Poliomyelitis (Tables II, III, IV). — There were 1,189 cases reported for the year. The incidence of this disease this year was greater than for any year since 1909 when the disease was made reportable, excepting the year 1916, when 1,927 cases were reported. The tables referred to above show the morbidity, fatality and mortality for this disease for eighteen years. The Department, in co-operation with the Harvard Infantile Paralysis Commission, will publish during the coming year certain facts in regard to the epidemiology of this disease, as well as certain information regarding its treatment in the acute stage with convalescent poliomyelitis serum and the after care of those left with paralysis.

Diphtheria (Tables V, VI, VII). — The decline in diphtheria prevalence which began in the fall of 1924 reached a low point in the fall of 1926. In November of that year the incidence of the disease began to increase and this year the reported cases are 4,750, a 40% increase over 1926. The fatality rate, 5.6, is the lowest of which the Department has record, and the mortality rate, 6.3, is the second lowest on record.

Of the 249 diphtheria deaths in the commonwealth during the year 1926, 146 were studied intensively. This study brought out the following facts:

*Summary.*¹

1. None of the 146 individuals had been actively immunized against diphtheria.
2. Most of the deaths occurred among the poor.
3. One child died of diphtheria who was said to have had a negative Schick test two years previously.
4. About half of the cases were of the pharyngeal type.
5. Cardiac complications occurred in about one-third of the cases.
6. About two-thirds of the cases were hospitalized.
7. The average dose of antitoxin was about 40,000 U.

Scarlet Fever (Table XI). — This year 16,546 cases of scarlet fever were reported which is the largest number since the disease was made reportable in 1884. The fatality rate, .9, is the lowest in the history of the Department; the mortality rate, 3.4, compares favorably with mortality rates in recent years. While the reported incidence of this disease is constantly increasing, and the fatality rate, as one would expect with better reporting, decreasing, the mortality rate has also been decreasing. The mortality rate from this disease in 1870 was 46.9, while the mortality rate in any year in the last ten has never been above 5.5.

Smallpox (Table XII). — Two cases of smallpox were reported this year. Neither of these individuals had ever been vaccinated and both were infected out-

¹ Lane, E. A., and Forsbeck, F. C., Diphtheria Deaths in Massachusetts, 1926, *New England Journal of Medicine*, March 1, 1928.

side the state. Prior to the report of the first case on November 8th, no smallpox had been reported in this state since April 14, 1926, a period of eighteen months.

Typhoid Fever (Tables XVI, XVII, XVIII, XIX). — The reported incidence of this disease, 466 cases, is the lowest recorded in any year since the disease was made reportable in 1893. Forty-four deaths, giving a mortality rate of 1.0, is also the lowest mortality rate ever recorded from this disease in the state. Table XVII shows the source and mode of infection of reported cases from 1917 through 1927.

The first typhoid carrier in this state was discovered in 1910. Since that date 100 carriers have been discovered, 14 of whom were discovered during this year, the largest number discovered in any one year. At the present time the Department has knowledge of the whereabouts of 57 carriers still living within the state.

OUTBREAKS DURING 1927.

1. Wakefield reported during February and March, 12 cases of typhoid fever. The infection occurred at a church supper. The vehicle of infection was corned beef, which was prepared and handled by a carrier.

2. Billerica reported 23 cases of typhoid fever in March. These cases were due to the infection of a raw milk by a milk handler who was found to be a carrier.

3. Boston reported during September an outbreak of 21 cases of typhoid fever connected with the Carney Hospital. The probable source of infection in this instance was a nurse suffering from a mild attack of the disease, who assisted in the preparation and handling of food.

4. Four cases of typhoid fever occurred at the Concord Academy in November. The evidence indicates that these cases were due to the infection of food by a carrier employed in the kitchen.

5. The total cases of typhoid fever in connection with the Lincoln-Concord-Weston outbreak¹ was 51²; 44 of these were reported in December, 1926, and 7 in January, 1927.

6. During December, 1926, and January, 1927, Boston reported 35 cases of typhoid fever¹ in connection with a pasteurized milk supply. One of the producers who later died of the disease continued at work in the pasteurization plant at least fourteen days while ill with the disease. During the time he hand-bottled the milk and may have delivered unpasteurized milk to consumers who called at the plant. No other source of infection of this supply was discovered. The source of the proprietor's infection was never determined.

7. During the fall of 1926 and January, 1927, 13 cases of typhoid fever occurred among the employees of the Bourne Mill at Tiverton, Rhode Island. Four of the cases resided in Tiverton and the balance in Fall River. Only 9 of the cases were reported to this Department. With the co-operation of the local health officials of both communities, the mill owners and the health departments of the two states concerned, the source of this infection was determined to be a leaky cross connection between a polluted water supply used for industrial purposes and the drinking water supply of the mill. This condition was remedied immediately by the mill management.

8. Thirty cases of diphtheria occurred in Marlboro during August, September and October; 11 of these cases centered about a related group of individuals living in the same neighborhood; 12 cases occurred in connection with an unrecognized case of nasal diphtheria in a school; 7 more cases were related indirectly to both these groups.³

MILK LEGISLATION.

In view of the Department's continued interest in milk legislation, and the relation of milk to the spread of communicable disease, it is well to note the following facts:

Under the provisions of Chapter 259 of the Acts of 1927 no person shall maintain an establishment for the pasteurization of milk without a license from the board of health of the town where the establishment is to be located. This act gives the

¹ Carried as 1926 outbreak.

² One case not officially reported.

³ Lane, E. A., Diphtheria Epidemic—Marlboro, August–November, 1927, *New England Journal of Medicine*, March 8, 1928.

Department the power to make rules and regulations and power both to the local board and the Department to suspend the license if the establishment is operated or maintained in an unsanitary manner. A detailed discussion of this bill will be found in the Report of the Director of the Division of Food and Drugs.

Thirty-four cities and towns, representing about forty-seven per cent of the total state population, require that the milk sold in their communities be pasteurized or from tuberculosis free herds. Legislation has been introduced again this year by the Department which, if passed, will prevent the sale, after January 1, 1931, of any milk in Massachusetts unless it be from tuberculosis free herds or pasteurized.

DISPENSARIES.

Sections 51-56, Chapter 111, General Laws, give the Department power to inspect and license dispensaries as well as to make rules and regulations as to how they shall be conducted. Defined by statute a "dispensary shall mean any place or establishment, not conducted for profit, where medical or surgical advice or treatment, medicine or medical apparatus, is furnished to persons not residing therein; or any place or establishment, whether conducted for charitable purposes or for profit, advertised, announced, conducted or maintained under the name 'dispensary' or 'clinic,' or other designation of like import."

A survey of eighty-five dispensaries, under the definition quoted above, was made during 1927, seventy-five of which were licensed by the Department. Five establishments were considered as not coming within the scope of the statutes and applications for the balance, we anticipate, will come in during the coming year.

On November 22, 1927, the Department adopted the following:

Rules and Regulations for Dispensary License.

(1) A licensed physician shall be in attendance at each clinic session where medical or surgical service is given and must see each case.

(2) A registered nurse shall be in attendance throughout the clinic period at which medical or surgical service is given.

(3) Two rooms, one for a waiting room, the other for examination and treatment, shall be provided where medical or surgical service is given.

(4) Running water and apparatus for sterilizing instruments by boiling shall be available.

(5) An individual record shall be kept on each case.

DISTRICT HEALTH OFFICERS.

In May, 1927, the number of District Health Officers was reduced from seven to six. Re-allocation of territory was based on the fact that Barnstable County had a full time health officer. The so-called Metropolitan District, which includes twenty-one cities and towns, was made having in mind the accessibility of these communities to the central office by both electric and steam transportation. This re-assignment of territory makes available to remote areas in the state one more individual in the division office for emergency service in connection with outbreaks of disease.

The activities of the District Health Officers during the past year, in addition to those required by statute, such as inspection of jails, lock-ups, hospitals, etc., have been as follows: routine visits to local boards of health, investigations of outbreaks of communicable disease, assistance in the furthering of the ten-year tuberculosis program and in the establishment of cancer clinics in their respective districts. As in the past, diphtheria immunization programs have been urged through local boards of health. This year a special effort has been made to have each community assume responsibility for an annual immunization program which would involve the protection with toxin-antitoxin of the entering school classes at least. The result has been that many more local boards of health are now carrying on a continuous diphtheria immunization program with community funds, usually with the co-operation of the local medical profession.

In addition to the routine visits made by the District Health Officers, the Division office staff made special visits to sixty-five different communities in connection with problems in the control of communicable disease either from the epidemiological or administrative point of view.

VENEREAL DISEASE.

This year 4,294 cases of gonorrhea and 1,666 cases of syphilis were reported. Table VIII shows certain facts in regard to these two diseases for the last ten years. More intensive effort toward the control of these diseases by a broader policy of arsenical distribution is planned for the coming year. In addition to the educational aspects of social hygiene, which are being carried on very effectively by a part time physician, it is planned to have an Epidemiologist in immediate charge of all the activities connected with social hygiene, especially those having to do with treatment of venereal disease.

Of the 52 treatment centers in the state, 15 are subsidized by the Department; 13,219 individuals made 160,342 visits to the subsidized clinics in 1927.

The social worker and special investigator on our staff have been concerned with the following activities: investigation of sources of infection, as well as lapsed and delinquent cases; visits to local boards of health, community social agencies, courts, probation officers and police officials. Their community contacts in interpreting to the different agencies, especially the local boards of health, the various phases of social hygiene problems have been undoubtedly worth while. That this is a fact is indicated by the interest more communities are showing in the appointment of social service workers and socially trained nurses in connection with the follow-up of delinquent patients and the investigation of sources of infection.

Co-operation between the Massachusetts League of Women Voters and this Department has continued especially in connection with social hygiene in its educational aspects. Through Dr. Helen I. McGillicuddy approximately 9,000 people have been reached during the year.

THE BACTERIOLOGICAL LABORATORY.

During the year ended December 31, 1927, the Bacteriological Laboratory examined 33,425 specimens. This is an increase of 8,098 over the number examined last year. The principal increases were in the number of cultures examined for diphtheria bacilli and for typhoid bacilli. For the latter examination there was an increase of 84%.

There were slight decreases in the malaria examinations and in pneumococcus type determination. For 32% of the pneumonia specimens the residence of the patients was given as Boston.

Work has been started on the testing of human blood for agglutinins for bacillus abortus and related bacilli. Selected specimens of blood which have been sent to the laboratory for the Widal test for typhoid fever, if negative for typhoid, have been examined for abortus agglutinins. To date, negative findings have been obtained.

TABLE I. — *Laboratory Examinations.*

	Positive.	Negative.	Atypical.	Total
Diphtheria (primary)	845	9,711	—	10,556
Diphtheria (secondary)	1,987	3,967	—	5,954
Tuberculosis (sputum)	905	3,680	—	4,585
Typhoid fever (Widal)	217	1,803	59	2,079
Typhoid fever (culture)	155	2,852	—	3,007
Malaria	3	41	—	44
Gonorrhea	1,037	4,592	—	5,629
Miscellaneous	—	—	—	1,160

Pneumococcus Type Determination:

Type I	(11.6%)	33
Type II	(2.8%)	8
Type III	(10.9%)	31
Group IV	(74.7%)	212
No pneumococci		127
		411

Total		33,425
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TABLE II. — *Anterior Poliomyelitis Cases, 1907-27, by Months.*

YEAR.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Un- known	Total
1907	1	5	1	5	2	4	12	33	57	48	21	16	29	234
1908	1	1	2	1	2	7	37	37	19	15	9	—	5	136
1909	3	4	5	5	7	34	148	187	121	74	17	11	307	923
1910	10	2	2	4	4	22	159	157	129	97	46	22	191	845
1911	11	2	9	8	7	8	17	61	50	37	16	6	38	260
1912	7	3	8	5	15	12	34	28	25	21	10	1	—	169
1913	4	3	4	2	6	1	10	60	125	89	38	19	—	361
1914	14	6	8	8	4	11	10	19	25	31	9	6	—	151
1915	5	4	6	5	5	4	9	26	15	28	16	12	—	135
1916	6	3	5	2	3	11	106	252	623	701	179	36	—	1,927
1917	14	2	8	9	9	15	38	38	16	11	10	4	—	174
1918	5	3	6	6	6	6	10	20	20	7	7	3	—	99
1919	4	2	2	4	—	3	5	12	9	17	5	3	—	66
1920	2	4	4	1	—	5	16	93	273	190	77	31	—	696
1921	10	10	7	3	6	4	26	61	54	27	15	10	—	233
1922	8	4	4	3	—	4	23	54	63	28	21	5	—	217
1923	10	9	5	6	4	4	8	26	38	48	40	25	—	223
1924	24	6	9	7	5	5	12	39	88	56	23	13	—	277
1925	9	4	7	2	1	2	11	30	44	31	14	12	—	167
1926	6	4	5	5	4	5	21	75	59	27	26	8	—	245
1927	6	2	3	4	7	11	22	174	373	376	146	65	—	1,189
Total	150	83	110	95	97	178	734	1,452	2,226	1,959	745	308	560	8,727

TABLE III. — *Anterior Poliomyelitis, 1909-27, by Age Groups.¹*

YEAR.	0-4.	5.	6-10.	11-20.	21-30.	31-72.	Known Ages.	Unknown Ages.	Total.
1909	408	32	98	46	21	10	615	308	923
1910	345	51	93	69	28	15	601	244	845
1911	(missing)								

	0-4.	5-9.	10-19.	20 and over.	Known Ages.	Unknown Ages.	Total.
1912	60	15	8	7	90	79	169
1913	181	58	44	9	292	69	361
1914	62	15	10	9	96	55	151
1915	76	24	17	5	122	13	135
1916	1,289	366	110	85	1,850	77	1,927
1917	(missing)						

	0-4.	5-9.	10-14.	15-19.	20 and over.	Known Ages.	Unknown Ages.	Total.
1918	63	13	7	5	7	95	4	99
1919	39	13	6	3	2	63	3	66
1920	347	165	67	34	39	652	44	696
1921	98	53	30	13	31	225	8	233
1922	103	52	27	15	10	207	10	217
1923	126	46	20	8	12	212	11	223
1924	126	65	39	15	23	268	9	277
1925	81	27	28	8	17	161	6	167
1926	107	70	23	15	24	239	6	245
1927	529	361	131	67	67	1,155	34	1,189

TABLE IV. — *Anterior Poliomyelitis.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1909 ²	923	27.8	— ²	—	—
1910	845	25.0	54	1.6	6.4
1911	232	6.7	36	1.0	15.5
1912	169	4.8	76	2.2	45.0
1913	361	10.1	69	1.9	19.1
1914	151	4.1	45	1.2	29.8

¹ In spite of the difference in the age groupings prior to 1918, and the incompleteness of the figures, it is thought desirable that this table be published at this time.

² Made reportable November 4, 1909.

TABLE IV. — *Anterior Poliomyelitis.* — Concluded.

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1915	135	3.6	32	.9	23.7
1916	1,927	51.6	452	12.1	23.5
1917	174	4.6	51	1.4	29.3
1918	99	2.6	37	1.0	37.4
1919	66	1.7	15	.4	22.7
1920	696	18.0	144	3.7	20.7
1921	233	5.9	48	1.2	20.6
1922	217	5.4	33	.8	15.2
1923	223	5.5	35	.9	15.7
1924	277	6.8	27	.7	9.7
1925	167	4.0	52	1.3	31.1
1926	245	5.8	44	1.0	18.0
1927	1,189	27.8	169	4.0	14.2

TABLE V. — *Diphtheria.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918-22 (av.)	8,058	206.9	601	15.5	7.5
1923	9,018	222.8	579	14.3	6.4
1924	7,290	177.7	534	13.0	7.3
1925	4,482	107.8	333	8.0	7.4
1926	3,401	80.7	249	5.9	7.3
1927	4,750	111.3	268	6.3	5.6

TABLE VI. — *Diphtheria Cases, 1918-27, by Age Groups.*

YEAR.	0-4.		5-9.		10-14.		15 & OVER.		UNKNOWN.		Total Cases.
	Cases.	%	Cases.	%	Cases.	%	Cases.	%	Cases.	%	
1918	1,996	28.8	2,087	30.2	850	12.3	1,309	18.9	680	9.9	6,922
1919	2,052	25.9	2,858	36.0	1,145	14.5	1,159	14.6	716	9.0	7,929
1920	2,016	26.8	2,601	34.6	954	12.7	1,153	15.4	789	10.5	7,513
1921	2,464	27.1	3,456	37.9	1,180	13.0	1,244	13.7	756	8.3	9,100
1922	2,643	29.9	3,271	37.1	1,123	12.7	1,169	13.3	620	7.0	8,826
1923	2,607	28.9	3,707	41.1	1,043	11.6	1,158	12.8	503	5.6	9,018
1924	2,281	31.3	2,374	32.5	894	12.3	1,040	14.3	701	9.6	7,290
1925	1,360	30.4	1,544	34.4	501	11.2	670	14.9	407	9.1	4,482
1926	1,059	31.1	1,157	34.0	304	8.9	550	16.2	331	9.8	3,401
1927	1,369	28.8	1,798	37.9	543	11.4	717	15.1	323	6.8	4,750

TABLE VII. — *Diphtheria Deaths, 1918-27, by Age Groups.*

YEAR.	0-4.		5-9.		10-14.		15 & OVER.		Total Deaths.
	Deaths.	%	Deaths.	%	Deaths.	%	Deaths.	%	
1918	341	56.1	178	29.3	43	7.1	46	7.5	608
1919	341	57.5	190	32.0	32	5.4	30	5.1	593
1920	334	56.5	197	33.3	34	5.8	26	4.4	591
1921	327	53.9	216	35.6	40	6.6	24	3.9	607
1922	374	61.7	176	29.0	26	4.3	30	5.0	606
1923	334	57.7	193	33.3	21	3.6	31	5.4	579
1924	336	62.9	141	26.4	31	5.8	26	4.9	534
1925	199	59.8	101	30.3	17	5.1	16	4.8	333
1926	140	56.3	77	30.9	12	4.8	20	8.0	249
1927	136	50.7	96	35.8	18	6.7	18	6.7	268

TABLE VIII. — *Gonorrhea and Syphilis.*

YEAR.	GONORRHEA.		SYPHILIS.			
	Cases.	Case Rate per 100,000.	Cases.	Case Rate per 100,000.	Deaths.	Fatality Rate Per Cent.
1918-22 (av.)	6,975	179.0	2,966	76.3	240	8.1
1923	4,885	120.7	1,891	46.7	194	10.3
1924	5,241	127.7	2,325	56.7	176	7.6
1925	5,192	124.9	2,147	51.6	148	6.9
1926	4,920	116.8	1,904	45.1	165	8.7
1927	4,294	100.6	1,666	39.0	135	8.1

TABLE IX. — *Lobar Pneumonia.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918	13,374	351.8	10,339	271.9	77.3
1919	4,585	119.5	2,614	68.2	57.0
1920	5,558	143.2	2,842	73.2	51.1
1921	4,080	103.7	1,823	46.3	44.7
1922	5,194	130.1	2,344	58.7	45.1
1923	4,759	117.6	2,313	57.2	48.6
1924	4,552	111.0	1,944	47.4	42.7
1925	5,544	133.3	2,364	56.9	42.6
1926	5,134	121.8	2,409	57.2	46.9
1927	4,279	100.2	1,969	46.1	46.0

TABLE X. — *Measles.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918-22 (av.)	22,492	578.7	293	7.6	1.3
1923	26,854	663.6	321	7.9	1.2
1924	22,425	546.6	165	4.0	.7
1925	28,816	693.0	337	8.1	1.2
1926	30,020	712.4	367	8.7	1.2
1927	13,498	316.2	87	2.0	.6

TABLE XI. — *Scarlet Fever.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918-22 (av.)	7,793	200.1	151	3.9	1.9
1923	12,300	303.9	155	3.8	1.3
1924	14,410	351.2	158	3.9	1.1
1925	10,319	248.2	117	2.8	1.1
1926	11,323	268.7	117	2.8	1.0
1927	16,546	387.6	144	3.4	.9

TABLE XII. — *Smallpox.*

YEAR.	Cases.	Deaths.
1918-22 (av.)	27	1
1923	6	0
1924	12	2
1925	3	0
1926	4	0
1927	2	0

TABLE XIII. — *Units of Arsphenamine, Sulpharsphenamine and Bichloridol Distributed.*

YEAR.	Arsphenamine. ¹	Sulpharsphenamine. ¹	Bichloridol. ²
1923	42,843	3,737 ³	12,800
1924	27,603	18,864	13,412
1925	26,121	27,911	17,043
1926	21,726	31,895	9,486
1927	23,350	28,716	15,900

TABLE XIV. — *Tuberculosis, Pulmonary.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918-22 (av.)	6,647	171.3	3,917	101.0	58.9
1923	5,356	132.3	3,062	75.7	57.2
1924	5,376	131.0	2,953	72.0	54.9
1925	5,385	129.5	2,883	69.3	53.5
1926	5,444	129.2	2,961	70.3	54.4
1927	5,049	118.3	2,774	65.0	54.9

¹ Based on 0.6 gram unit.² Collapsules.³ June to December.

TABLE XV. — *Tuberculosis, Non-Pulmonary.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918-22 (av.)	795	20.4	661	17.0	83.1
1923	807	19.9	528	13.0	65.4
1924	893	21.8	577	14.1	64.6
1925	825	19.8	576	13.9	69.8
1926	874	20.7	555	13.2	63.5
1927	807	18.9	429	10.0	53.2

TABLE XVI. — *Typhoid Fever.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918-22 (av.)	910	23.5	113	2.9	12.4
1923	622	15.4	70	1.7	11.3
1924	566	13.8	68	1.7	12.0
1925	592	14.2	73	1.8	12.3
1926	547	13.0	61	1.4	11.1
1927	466	10.9	44	1.0	9.4

TABLE XVII. — *Typhoid Fever Cases, 1917-27, Classified as to Source and Mode of Infection.*

	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.
1. Water	28	21	97	32	6	5	23	25	15	21	7
2. Milk:	85	82	48	50	146	18	9	17	8	92	37
Carrier	85	68	17	—	6	8	9	17	—	44	29
Case	—	1	—	—	13	10	—	—	—	28	8
Unknown	—	13	31	50	127	—	—	—	8	20	—
3. Foods:	68	—	1	4	—	4	3	15	12	6	43
Carrier	—	—	—	—	—	—	—	—	—	—	16
Case	64	—	—	—	—	—	—	—	—	—	21
Unknown	4	—	1	4	—	4	3	15	12	6	6
4. Contact:	96	62	120	98	108	66	45	55	40	21	32
Carrier	9	15	21	11	13	5	19	5	3	5	10
Case	87	47	99	87	95	61	26	50	37	16	22
5. Unknown	1,269	902	672	751	657	600	542	454	517	407	347
Known	277	165	266	184	260	93	80	112	75	140	119
Total	1,546	1,067	938	935	917	693	622	566	592	547	466

TABLE XVIII. — *Typhoid Fever Cases, 1918-27, by Age Groups.*

YEAR.	0-14.		15-39.		40 & OVER.		UNKNOWN.		Total Cases.
	Cases.	%	Cases.	%	Cases.	%	Cases.	%	
1918	320	30.0	526	49.3	154	14.4	67	6.3	1,067
1919	273	29.1	484	51.6	126	13.4	55	5.9	938
1920	299	32.0	475	50.8	141	15.1	20	2.1	935
1921	345	37.6	397	43.3	162	17.7	13	1.4	917
1922	196	28.3	345	49.8	130	18.8	22	3.1	693
1923	193	31.0	309	49.7	97	15.6	23	3.7	622
1924	157	27.7	272	48.1	120	21.2	17	3.0	566
1925	161	27.2	293	49.5	111	18.7	27	4.6	592
1926	164	30.0	255	46.6	110	20.1	18	3.3	547
1927	146	31.4	242	51.9	71	15.2	7	1.5	466

TABLE XIX. — *Typhoid Fever Deaths, 1918-27, by Age Groups.*

YEAR.	0-14.		15-39.		40 & OVER.		Total Deaths.
	Deaths.	%	Deaths.	%	Deaths.	%	
1918	18	11.3	102	63.7	40	25.0	160
1919	17	15.9	63	59.0	27	25.1	107
1920	15	15.8	51	53.7	29	30.5	95
1921	17	14.3	61	51.3	41	34.4	119
1922	11	12.8	50	58.1	25	29.1	86
1923	8	11.4	43	61.4	19	27.2	70
1924	9	13.2	32	47.1	27	39.7	68
1925	15	20.5	33	45.2	25	34.3	73
1926	9	14.8	33	54.1	19	31.1	61
1927	5	11.4	27	61.4	12	27.2	44

TABLE XX. — *Whooping Cough.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate Per Cent.
1918-22 (av.)	7,202	185.4	419	10.8	5.8
1923	10,612	262.2	493	12.2	4.6
1924	4,062	99.0	147	3.6	3.6
1925	8,077	194.2	269	6.5	3.3
1926	11,547	274.0	391	9.3	3.4
1927	6,273	146.9	149	3.5	2.4

TYPHOID FEVER IN MASSACHUSETTS.¹CARL R. DOERING, M.D., *Statistical Consultant.*

The death rate from typhoid fever has decreased since about 1860, more rapidly than the decrease that would be expected if the disease were dying out naturally. The discovery of the cause and the consequent control of water, milk and food supplies and other environmental factors have undoubtedly brought about the rapid decrease.

Compared with the other nine registration states of 1900, then, as well as now, Massachusetts has the lowest rate and also has the highest rate of annual decrease in recent years.

Annual fluctuations of the death rate from the trend line represent the degree of control maintained upon the disease. Lack of control measures would by and large produce epidemic conditions and efficient control would lead to an endemic picture. The computation of certain variation coefficients shows that Massachusetts is low among the states, the more rural states showing higher coefficients which indicate epidemic conditions.

Correlations of the annual fluctuations show that when typhoid is high in neighboring states it also tends to be high in Massachusetts. This suggests that a significant amount of typhoid in Massachusetts is the result of importation. Equally valid however is the inference that Massachusetts exports typhoid.

If Boston, Worcester and Springfield are excluded, the morbidity and mortality rates increase from towns under 2,500 to towns of 100,000. The case fatality remains constant. This points to the conclusion that typhoid in this state is not a rural problem but is one in which contact direct or indirect plays an important part.

Table A shows that towns using water from the Metropolitan system have significantly lower morbidity and mortality rates. This may not, however, be wholly attributed to the difference in water supplies.

Table B shows the course of water and milk outbreaks. The milk epidemics are explosive and short, the water outbreaks being long drawn out.

Incidentally it was noticed in the study of the age specific rates back in 1849 that in the 50's typhoid was a disease of old age and that now it is one affecting young adults. This change in its attack cannot be easily explained by control measures since these should have been equally effective upon all age groups. An explanation based upon an acquired immunity of the population is tentatively offered.

¹ This study will be published in its entirety in one of the journals.

TABLE A.
Typhoid Fever in Metropolitan Water District and the Rest of the State.

	AVERAGES — 1916-24.		RATES PER 100,000 POPULATION IN 1920.		Fatality (Per Cent).
	No. of Cases.	No. of Deaths.	Case.	Death.	
Metropolitan Water District	226	27	18.7 ± 1.25	2.2 ± .42	11.9 ± 2.15
Rest of State	752	90	28.4 ± 1.04	3.4 ± .36	12.0 ± 1.18
Total	978	117	25.4 ± .81	3.0 ± .28	12.0 ± 1.04

TABLE B.
Course of Milk and Water Outbreaks.

Source of Out- break	WEEKS.																				MONTHS		Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	5	6	
Water	9	4	3	4	16	17	7	10	10	2	4	0	2	0	3	2	0	3	1	1	5	1	104
Milk	39	52	67	87	67	35	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	352

Cases and Deaths from Certain Communicable Diseases in Massachusetts from 1922 to 1926.

DISEASE.	1922.		1923.		1924.		1925.		1926.	
	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.
Population	3,991,333		4,046,923		4,102,513		4,158,103		4,213,693	
Actinomycosis	3	2	6	4	4	2	3	1	2	1
Anterior Poliomyelitis	217	33	223	35	277	27	167	52	245	44
Anthrax	3	1	7	2	11	2	5	1	13	1
Chicken Pox	5,177	8	7,983	11	8,985	9	7,516	9	8,284	7
Dog Bite	181	—	252	—	208	—	186	—	169	—
Dysentery	14	10	3	2	25	3	13	5	8	3
Encephalitis Lethargica	163	83	180	85	106	58	146	99	105	78
Epidemic Cerebrospinal Men- ingitis	105	47	121	41	128	39	112	35	116	39
German Measles	480	2	527	—	1,644	3	6,778	3	6,236	4
Influenza	7,453	569	2,466	742	405	277	1,244	519	2,193	718
Malaria	48	4	23	3	36	2	11	6	22	1
Mumps	4,358	2	7,707	6	9,431	12	2,674	6	5,117	2
Ophthalmia Neonatorum	1,219	—	1,480	—	1,820	—	1,988	—	1,832	—
Pellagra	15	9	16	11	18	12	19	10	16	11
Septic Sore Throat	123	25	197	27	170	47	116	29	129	35
Tetanus	33	21	28	18	41	23	45	35	30	23
Trachoma	96	—	62	—	55	—	75	—	53	—
Trichinosis	19	4	13	—	40	1	26	—	13	—
Glanders	—	—	—	—	—	—	—	—	—	—
Hookworm	42	—	12	—	18	—	23	—	8	—
Leprosy	1	—	1	—	—	—	—	—	1	—
Rabies	2	5	3	1	1	1	2	3	—	—
Typhus Fever	—	—	1	—	—	—	2	—	—	—

Cases and Deaths, with Case and Death Rates per 100,000 Population¹ for All Reportable Diseases during the Year 1927.

DISEASE.	Cases.	Case Rate per 100,000 Population.	Deaths.	Death Rate per 100,000 Population.	Fatality Rate (Per Cent).
Actinomycosis	3	.1	3	.1	100.0
Anterior Poliomyelitis	1,189	27.8	169	4.0	14.2
Anthrax	5	.1	—	—	—
Chicken Pox	9,927	232.5	8	.2	.1
Diphtheria	4,750	111.3	268	6.3	5.6
Dog Bite	378	8.9	—	—	—
Dysentery	14	.3	7	.2	50.0
Encephalitis Lethargica	79	1.9	61	1.4	77.2

¹ Population 1927: 4,269,253.

Cases and Deaths, with Case and Death Rates per 100,000 Population for All Reportable Diseases during the Year 1927. — Concluded.

DISEASE.	Cases.	Case Rate per 100,000 Population.	Deaths.	Death Rate per 100,000 Population.	Fatality Rate (Per Cent).
Epidemic Cerebrospinal Meningitis	75	1.8	43	1.0	57.3
German Measles	646	15.1	1	.02	.2
Gonorrhea	4,294	100.6	18	.4	.4
Hookworm	—	—	—	—	—
Influenza	515	12.1	326	7.6	63.3
Leprosy	—	—	—	—	—
Malaria	9	.2	1	.02	11.1
Measles	13,498	316.2	87	2.0	.6
Mumps	10,752	251.8	6	.1	.1
Ophthalmia Neonatorum ¹	1,827	42.8	—	—	—
Pellagra	15	.4	10	.2	66.7
Pneumonia Lobar	4,279	100.2	1,969	46.1	46.0
Rabies	2	.04	2	.04	100.0
Scarlet Fever	16,546	387.6	144	3.4	.9
Septic Sore Throat	141	3.3	50	1.2	35.5
Smallpox	2	.04	—	—	—
Syphilis	1,666	39.0	135	3.2	8.1
Tetanus	25	.6	23	.5	92.0
Trachoma	33	.8	—	—	—
Trichinosis ²	—	—	1 ²	.02	—
Tuberculosis, Pulmonary	5,049	118.3	2,774	65.0	54.9
Tuberculosis, Other Forms	807	18.9	429	10.0	53.2
Tuberculosis, Hilum	551	12.9	—	—	—
Typhoid Fever	466	10.9	44	1.0	9.4
Whooping Cough	6,273	146.9	149	3.5	2.4
Totals	83,816	1,963.2	6,728	157.6	8.0

¹ Includes 307 cases of suppurative conjunctivitis.

² Case not reported until January, 1928.

Cases and Deaths from Communicable Diseases by Months, 1927.

	JAN- UARY.		FEB- RUARY.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUGUST.		SEP- TEMBER.		OCTOBER.		NO- VEMBER.		DE- CEMBER.		TOTAL.		
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
Actinomycosis	1	-	2	1	-	3	1	4	1	7	1	11	2	22	7	174	28	373	45	376	1	51	146	65	10	1189	3
Anterior Poliomyelitis.	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	146	-	-	169	3
Anthrax	1729	-	1244	-	1167	1	971	1	854	1	874	1	874	1	423	1	78	-	412	-	958	1	1045	-	9927	5	
Chicken Pox.	401	-	27	24	429	27	377	26	336	13	388	21	264	18	216	16	291	14	542	23	542	29	590	30	4750	268	
Diphtheria	24	-	32	-	25	-	18	-	23	-	32	-	34	-	32	-	43	-	25	-	38	-	52	-	378	-	
Dog Bite	6	1	5	7	14	5	6	2	8	7	3	7	6	1	5	5	7	4	4	1	6	3	2	5	79	61	
Dysentery	6	6	5	7	14	5	6	2	8	7	3	7	6	1	5	5	7	4	4	1	6	3	2	5	79	61	
Encephalitis Lethargica	6	6	5	7	14	5	6	2	8	7	3	7	6	1	5	5	7	4	4	1	6	3	2	5	79	61	
Epidemic Cerebrospinal Meningitis.	5	4	3	1	5	5	10	8	9	-	8	3	4	5	5	3	4	2	4	2	10	4	8	6	75	43	
German Measles	62	-	39	68	92	1	92	1	80	-	79	-	50	-	8	-	24	-	26	-	57	-	61	-	646	1	
Gonorrhea	444	1	270	5	323	1	336	2	290	3	315	1	372	1	377	1	372	2	412	-	411	-	372	2	4294	18	
Hookworm	74	-	57	70	89	42	65	38	38	25	16	17	11	5	21	4	20	12	32	22	37	21	42	34	515	356	
Influenza	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Leprosy.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Malaria.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Measles.	719	4	855	9	1297	4	1406	10	1761	8	1734	12	1023	6	253	2	151	2	526	4	1221	9	2552	17	13498	87	
Mumps.	1272	-	1306	-	2027	1	1720	1	1611	-	1044	2	338	-	145	-	116	-	181	-	402	-	590	2	10752	6	
Ophthalmia Neonatorum	162	-	122	-	221	-	162	3	123	-	168	-	110	-	152	-	150	-	169	-	161	-	127	-	1827	-	
Pellagra.	2	2	2	1	-	-	2	-	-	-	-	-	1	1	3	-	1	-	2	-	1	-	1	-	15	10	
Pneumonia, Lobar	592	315	484	222	563	236	511	231	364	192	317	124	154	72	133	53	155	83	211	95	324	163	471	183	4279	1969	
Rabies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Scarlet Fever.	2150	14	2129	28	2517	18	2015	13	1811	16	1587	12	643	6	349	9	432	4	728	7	968	9	1217	8	16546	144	
Septic Sore Throat	24	5	16	4	12	5	21	6	14	8	7	3	9	3	9	2	9	6	2	2	9	4	9	2	141	50	
Smallpox	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Syphilis.	199	10	138	8	154	18	123	10	119	13	140	9	132	8	128	13	111	4	144	16	153	10	125	16	1666	135	
Tetanus.	1	1	1	1	1	1	1	2	1	2	4	4	3	2	2	1	5	3	4	2	3	3	1	1	25	23	
Trachoma	4	-	6	1	2	-	3	-	5	2	6	4	4	3	2	1	5	3	4	2	3	3	1	1	33	1	
Trichinosis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Tuberculosis, Pulmonary	404	229	460	268	490	273	446	288	440	239	457	228	439	252	410	193	384	192	390	205	383	206	326	201	5049	2774	
Tuberculosis, Other Forms.	66	42	65	34	61	34	68	43	72	41	94	40	63	30	70	36	72	34	61	27	55	23	60	45	807	429	
Tuberculosis, Hilar	31	-	59	-	149	-	69	-	29	-	42	-	42	-	24	-	25	-	35	-	36	-	25	1	561	-	
Typhoid Fever	36	4	25	1	44	1	26	4	27	3	17	2	20	7	67	4	82	6	48	6	39	7	25	1	466	44	
Whooping Cough.	641	11	543	23	760	23	625	18	474	10	406	11	360	6	365	8	387	8	341	8	606	5	755	16	6273	149	

*Index to Line Numbers in the Table of Cases and Deaths from Diseases Dangerous
to the Public Health.*

Abington	122	Dunstable	342	Lincoln	257
Acton	191	Duxbury	229	Littleton	252
Acushnet	138			Longmeadow	151
Adams	65	East Bridgewater	154	Lowell	11
Agawam	107	East Brookfield	286	Ludlow	87
Alford	354	East Longmeadow	156	Lunenburg	216
Amesbury	73	Eastham	320	Lynn	12
Amherst	118	Easthampton	74	Lynnfield	258
Andover	76	Easton	124		
Arlington	34	Edgartown	268	Malden	20
Ashburnham	204	Egremont	322	Manchester	189
Ashby	288	Enfield	302	Mansfield	110
Ashfield	287	Erving	260	Marblehead	91
Ashland	186	Essex	259	Marion	266
Athol	85	Everett	30	Marlborough	52
Attleboro	45			Marshfield	218
Auburn	127	Fairhaven	70	Mashpee	344
Avon	195	Fall River	8	Mattapoisett	233
Ayer	174	Falmouth	130	Maynard	95
		Fitchburg	27	Medfield	146
Barnstable	117	Florida	334	Medford	21
Barre	160	Foxborough	128	Medway	165
Becket	297	Frammingham	42	Melrose	44
Bedford	241	Franklin	100	Mendon	281
Belchertown	163	Freetown	231	Merrimac	199
Bellingham	168			Methuen	40
Belmont	51	Gardner	48	Middleborough	86
Berkley	273	Gay Head	358	Middlefield	355
Berlin	275	Georgetown	225	Middleton	221
Bernardston	292	Gill	289	Milford	58
Beverly	43	Gloucester	38	Millbury	108
Billerica	125	Goshen	349	Millis	219
Blackstone	133	Gosnold	359	Millville	197
Blandford	330	Grafton	103	Milton	63
Bolton	294	Granby	296	Monroe	362
Boston	3	Granville	312	Monson	131
Bourne	166	Great Barrington	114	Montague	98
Boxborough	340	Greenfield	60	Monterey	338
Boxford	313	Greenwich	325	Montgomery	357
Boylston	282	Groton	188	Mount Washington	365
Braintree	64	Groveland	200		
Brewster	300			Nahant	228
Bridgewater	82	Hadley	177	Nantucket	162
Brimfield	293	Halifax	308	Natick	66
Brookton	77	Hamilton	205	Needham	83
Brookfield	255	Hampden	309	New Ashford	364
Brookline	26	Hancock	315	New Bedford	10
Buckland	236	Hanover	181	New Braintree	329
Burlington	234	Hanson	203	New Marlborough	284
		Hardwick	172	New Salem	319
Cambridge	9	Harvard	311	Newbury	249
Canton	123	Harwich	206	Newburyport	57
Carlisle	316	Hatfield	184	Newton	19
Carver	250	Haverhill	25	Norfolk	270
Charlemont	295	Hawley	341	North Adams	41
Charleton	198	Heath	345	North Andover	101
Chatham	230	Hingham	115	North Attleborough	79
Chelmsford	105	Hinsdale	283	North Brookfield	164
Chelsea	24	Holbrook	161	North Reading	222
Cheshire	215	Holden	152	Northampton	36
Chester	238	Holland	360	Northborough	210
Chesterfield	326	Holliston	179	Northbridge	81
Chicopee	28	Holyoke	18	Northfield	227
Chilmark	351	Hopedale	159	Norton	176
Clarksburg	267	Hopkinton	185	Norwell	245
Clinton	62	Hubbardston	280	Norwood	61
Cohasset	171	Hudson	93		
Colrain	243	Hull	173	Oak Bluffs	256
Concord	99	Huntington	239	Oakham	314
Conway	290			Orange	132
Cumington	321	Ipswich	121	Orleans	279
		Kingston	187	Otis	332
				Oxford	144
Dalton	141				
Dana	304	Lakeville	254	Palmer	75
Danvers	71	Lancaster	183	Paxton	310
Dartmouth	78	Lanesborough	269	Peabody	46
Dedham	59	Lawrence	15	Pelham	318
Deerfield	170	Lee	145	Pembroke	244
Dennis	226	Leicester	140	Pepperell	178
Lighton	155	Lenox	175	Peru	363
Douglas	196	Leominster	39	Petersham	303
Dover	278	Leverett	306	Phillipston	333
Iracut	106	Lexington	92	Pittsfield	23
Ludley	135	Leyden	350	Plainfield	348

Plainville	242	South Hadley	102	Warren	142
Plymouth	69	Southampton	285	Warwick	337
Plympton	317	Southborough	207	Washington	352
Prescott	353	Southbridge	56	Watertown	35
Princeton	299	Southwick	262	Wayland	201
Provincetown	153	Spencer	109	Webster	68
Quincy	16	Springfield	7	Wellesley	77
Randolph	120	Sterling	237	Wellfleet	301
Raynham	202	Stockbridge	223	Wendell	331
Reading	89	Stoneham	84	Wenham	274
Rehoboth	194	Stoughton	94	West Boylston	212
Revere	33	Stow	272	West Bridgewater	167
Richmond	307	Sturbridge	217	West Brookfield	261
Rochester	277	Sudbury	246	West Newbury	265
Rockland	97	Sunderland	263	West Springfield	55
Rockport	147	Sutton	214	West Stockbridge	264
Rowe	347	Swampscott	88	West Tisbury	343
Rowley	251	Swansea	150	Westborough	112
Royalston	298	Taunton	31	Westfield	47
Russell	253	Templeton	139	Westford	149
Rutland	193	Tewksbury	129	Westhampton	339
Salem	29	Tewksbury State Infirmary	366	Westminster	208
Salisbury	220	Tisbury	247	Weston	169
Sandisfield	323	Tolland	361	Westport	137
Sandwich	248	Topsfield	291	Westwood	224
Saugus	67	Townsend	213	Weymouth	50
Savoy	335	Truro	324	Whately	271
Scituate	132	Tyngsborough	276	Whitman	96
Seekonk	136	Tyringham	346	Wilbraham	180
Sharon	157	Upton	209	Williamsburg	211
Sheffield	232	Uxbridge	113	Williamstown	143
Shelburne	240	Wakefield	53	Wilmington	148
Sherborn	305	Wales	327	Winchendon	116
Shirley	192	Walpole	104	Winchester	72
Shrewsbury	111	Waltham	32	Windsor	336
Shutesbury	356	Ware	90	Winthrop	54
Somerset	126	Wareham	119	Woburn	49
Somerville	13			Worcester	5
				Worthington	328
				Wrentham	158
				Yarmouth	235

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation estimated as of July 1, 1927.	An- terior Polio- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	Massachusetts	4,269,283	1189	169	9927	8	4750	268	75	43	646	1	4294	18
2	CITIES OF OVER 500,000.													
3	Boston	793,145	277	64	2823	1	1259	59	23	29	162	-	2378	7
4	CITIES OF OVER 150,000.													
5	Worcester	195,471	29	6	762	1	257	14	-	-	32	-	269	-
6	CITIES, 100,000-150,000.	838,391	186	30	1572	2	1279	97	21	4	81	-	712	3
7	Springfield	147,400	12	6	341	-	256	18	3	2	16	-	171	2
8	Fall River	132,638	24	3	161	-	141	18	4	-	2	-	90	-
9	Cambridge	123,944	54	4	614	-	141	-	5	-	-	-	126	1
10	New Bedford	118,821	11	2	152	1	304	19	1	-	8	-	64	-
11	Lowell	109,243	13	2	75	1	191	18	3	-	3	-	156	-
12	Lynn	104,766	42	8	124	-	136	19	4	1	15	-	73	-
13	Somerville	101,579	30	5	105	-	110	5	1	1	14	-	32	-
14	CITIES, 50,000-100,000.	444,857	94	9	979	1	275	16	7	2	76	-	161	3
15	Lawrence	93,212	19	1	63	-	35	8	2	1	5	-	63	1
16	Quincy	65,275	17	1	82	-	54	1	-	-	13	-	18	-
17	Brockton	64,954	7	1	123	-	30	-	1	-	5	-	22	1
18	Holyoke	61,187	4	1	43	1	45	5	3	-	6	-	17	1
19	Newton	55,982	18	1	439	-	25	-	-	-	21	-	7	-
20	Malden	52,939	13	-	49	-	52	2	1	1	3	-	14	-
21	Medford	51,308	16	4	180	-	34	-	-	-	23	-	20	-
22	CITIES AND TOWNS, 25,000-50,000.	556,595	234	23	948	-	620	38	7	3	73	1	392	1
23	Pittsfield	49,066	1	1	60	-	16	3	3	2	1	-	34	-
24	Chelsea	48,986	20	1	55	-	31	3	1	-	2	-	12	-
25	Haverhill	47,239	111	15	86	-	78	3	-	-	11	-	159	-
26	Brookline	44,796	16	-	178	-	8	-	-	-	10	-	7	-
27	Fitchburg	44,714	2	-	17	-	36	3	-	-	1	-	17	-
28	Chicopee	44,310	2	-	18	-	51	2	-	-	1	-	6	-
29	Salem	42,945	19	3	61	-	133	11	-	-	6	-	1	-
30	Everett	42,907	14	-	88	-	46	-	-	-	4	-	39	-
31	Taunton	40,162	5	-	45	-	12	1	1	-	2	-	2	-
32	Waltham	36,388	9	1	81	-	87	6	-	-	3	1	14	-
33	Revere	35,162	19	1	49	-	55	-	-	-	4	-	58	-
34	Arlington	27,632	8	-	111	-	10	1	1	-	11	-	13	-
35	Watertown	27,203	7	-	20	-	43	-	-	-	1	-	3	-
36	Northampton	25,085	1	1	79	-	14	5	1	1	16	-	27	1
37	CITIES AND TOWNS, 10,000-25,000.	675,896	168	13	1481	1	636	32	10	3	131	-	180	1
38	Gloucester	23,555	16	-	5	-	21	2	-	-	2	-	5	-
39	Leominster	23,137	-	-	23	-	43	2	-	-	2	-	19	-
40	Methuen	22,926	6	-	84	-	8	-	-	-	3	-	-	-
41	North Adams	22,904	3	2	15	-	9	1	-	-	-	-	4	-
42	Framingham	22,811	1	-	43	-	7	-	-	-	13	-	18	-
43	Beverly	22,737	2	-	24	-	20	1	-	-	-	-	18	-
44	Melrose	21,004	4	-	17	-	5	-	2	-	3	-	6	-
45	Attleboro	21,003	3	1	61	-	23	2	1	-	1	-	1	-
46	Peabody	20,005	6	-	24	-	20	2	1	1	-	-	10	-
47	Westfield	19,657	2	-	25	-	80	5	-	-	1	-	-	-
48	Gardner	19,484	6	-	3	-	1	-	-	-	-	-	26	-
49	Woburn	19,140	3	-	9	-	16	-	-	-	-	-	-	-
50	Weymouth	18,193	11	2	14	-	12	1	-	-	-	-	-	-
51	Belmont	17,187	6	-	160	-	23	-	-	-	16	-	7	-
52	Marlboro	16,751	-	-	20	-	61	4	-	-	1	-	1	-
53	Wakefield	16,718	5	-	17	-	5	-	-	-	2	-	-	-
54	Winthrop	16,457	3	-	82	-	11	-	1	-	1	-	8	-
55	West Springfield	16,131	1	-	15	-	39	2	1	-	-	-	-	-
56	Southbridge	16,020	-	-	5	-	14	-	-	-	-	-	-	-
57	Newburyport	15,672	12	-	32	-	-	-	1	-	4	-	-	1
58	Milford	15,339	5	1	32	1	2	-	-	-	-	-	1	-
59	Dedham	15,257	12	1	35	-	1	-	-	-	1	-	-	-
60	Greenfield	15,154	2	-	80	-	14	1	1	1	37	-	7	-
61	Norwood	14,801	7	-	15	-	3	-	-	-	4	-	-	-
62	Clinton	14,693	-	-	25	-	2	-	-	-	-	-	4	-
63	Milton	14,351	7	-	71	-	6	-	-	-	8	-	2	-
64	Braintree	14,311	4	-	28	-	3	-	-	-	1	-	2	-
65	Adams	13,763	1	-	10	-	37	5	-	-	-	-	-	-
66	Natick	13,710	4	-	46	-	20	-	-	-	2	-	6	-
67	Saugus	13,542	5	1	74	-	10	-	-	-	-	-	4	-
68	Webster	13,443	-	-	-	-	4	-	-	-	-	-	-	-
69	Plymouth	13,230	4	1	24	-	7	-	-	-	1	-	1	-
70	Fairhaven	12,141	-	-	43	-	16	-	1	-	2	-	2	-
71	Danvers	12,093	1	1	32	-	11	-	-	-	2	-	-	-
72	Winchester	12,026	1	-	73	-	2	-	1	1	1	-	4	-
73	Amesbury	11,740	12	1	37	-	-	-	-	-	3	-	11	-
74	Easthampton	11,724	1	1	-	-	2	-	-	-	1	-	5	-
75	Palmer	11,535	-	-	1	-	23	4	-	-	-	-	1	-

to the Public Health, 1927.

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
515	326	4279	1969	13498	87	10752	6	1827	-	16546	144	1666	135	5049	2774	807	429	466	44	6273	149	1
163	32	1380	533	4427	39	2385	-	1084	-	3775	54	857	56	1593	594	305	93	100	9	1132	29	2
14	7	264	113	71	-	455	-	130	-	490	3	169	6	253	135	56	35	21	6	276	6	3
122	65	923	345	953	7	1556	1	231	-	3052	19	276	21	1079	481	192	92	106	14	1060	27	4
20	12	151	66	54	1	210	1	28	-	223	1	82	4	112	65	22	15	11	-	274	6	5
23	13	133	57	93	1	71	-	62	-	178	1	59	8	183	109	22	18	28	3	104	2	6
44	6	237	58	498	4	713	-	17	-	488	3	33	2	198	102	44	10	7	1	271	4	7
4	18	79	33	21	-	116	-	101	-	347	2	29	5	207	92	48	18	17	4	48	1	8
7	2	79	32	16	1	216	-	8	-	170	1	44	1	110	47	21	16	22	3	75	8	9
9	7	119	57	89	-	86	-	8	-	1036	6	18	1	148	29	21	11	13	1	147	3	10
15	7	125	42	182	-	144	-	8	-	610	5	11	-	121	37	14	4	8	2	141	3	11
48	34	387	192	1561	8	2034	1	260	-	1984	13	129	8	407	191	54	46	40	3	1009	15	12
8	9	48	24	726	6	39	-	85	-	389	4	54	2	81	31	12	10	15	1	55	4	13
11	7	39	21	402	-	76	-	2	-	382	4	8	1	69	34	8	2	4	1	93	2	14
1	4	68	28	21	-	192	-	159	-	440	2	49	1	71	21	8	5	4	-	119	1	15
-	4	20	22	17	-	23	1	1	-	88	-	11	4	36	45	6	14	5	-	89	6	16
13	7	65	42	100	1	1100	-	-	-	157	-	2	-	48	16	8	5	3	-	442	1	17
11	4	77	26	23	-	104	-	11	-	182	3	3	-	43	25	5	6	-	-	84	2	18
4	3	70	29	272	1	500	-	2	-	346	2	2	1	59	19	7	5	3	1	127	2	19
68	42	474	191	1703	9	1043	2	48	-	2245	18	88	20	608	328	85	47	67	6	866	19	20
10	5	41	28	216	3	39	1	1	-	477	8	13	2	37	28	6	5	2	-	112	4	21
1	2	75	25	142	1	153	-	9	-	95	-	8	7	45	33	8	3	15	-	38	-	22
13	5	61	21	363	2	8	-	4	-	194	3	18	3	53	13	10	7	12	-	90	1	23
9	1	27	9	201	-	228	-	5	-	127	1	2	-	32	15	5	2	4	1	187	2	24
-	1	45	18	130	3	12	-	2	-	29	-	16	-	37	21	7	5	4	2	30	4	25
1	4	11	7	6	-	8	1	2	-	50	-	4	-	43	34	4	2	1	1	16	2	26
3	1	33	16	12	-	50	-	15	-	222	1	1	-	47	14	12	5	3	1	29	3	27
12	4	59	14	80	-	146	-	2	-	175	1	8	3	60	21	9	6	6	-	53	-	28
6	5	17	13	4	-	3	-	3	-	54	-	1	-	47	39	2	2	3	1	10	-	29
2	5	22	8	70	-	118	-	2	-	89	2	1	-	35	13	7	5	4	-	65	-	30
2	1	19	8	263	-	9	-	2	-	171	-	8	1	53	15	6	-	7	-	36	2	31
1	1	21	5	30	-	216	-	3	-	170	-	1	1	37	11	7	2	2	-	129	1	32
1	1	28	12	5	-	41	-	-	-	225	-	3	-	29	10	1	1	1	-	41	-	33
7	6	15	7	181	-	12	-	-	-	167	2	5	1	53	61	1	2	3	-	30	-	34
63	71	571	306	2882	11	1870	1	39	-	2930	19	63	6	584	300	73	51	56	4	962	32	35
1	1	15	8	5	-	2	-	3	-	79	2	1	-	12	8	3	2	-	-	11	5	36
1	1	27	13	32	-	3	-	-	-	32	1	3	1	20	5	2	3	-	-	34	2	37
2	1	8	3	205	2	18	-	-	-	156	1	-	1	26	7	6	2	5	-	106	1	38
2	5	4	3	4	-	7	-	-	-	192	4	6	-	17	9	1	1	3	-	2	1	39
3	2	12	9	538	1	247	-	-	-	53	1	6	-	29	9	4	1	-	-	72	-	40
1	-	27	8	5	1	22	-	1	-	121	1	15	1	11	7	7	2	3	-	28	-	41
9	-	43	14	157	1	33	-	4	-	74	1	1	-	20	1	8	3	4	1	21	3	42
2	3	15	15	7	-	37	-	-	-	87	-	2	-	81	34	6	3	-	-	3	-	43
2	3	17	13	27	1	18	-	1	-	74	-	1	-	18	6	3	1	1	-	29	3	44
2	3	16	13	1	-	2	-	3	-	32	-	-	-	13	30	3	1	2	1	6	-	45
3	10	5	4	11	-	7	-	-	-	64	-	10	-	36	10	-	-	6	-	13	2	46
1	1	8	12	74	-	8	-	1	-	105	-	-	-	7	8	1	2	-	-	3	1	47
3	3	14	1	13	-	270	-	-	-	87	1	-	-	15	5	1	-	-	-	29	1	48
1	5	10	8	2	-	50	-	-	-	84	1	1	-	25	6	5	1	4	-	24	1	49
12	-	18	11	14	-	84	-	-	-	64	-	3	-	13	6	5	1	1	3	26	1	50
2	-	10	16	-	-	54	-	5	-	43	-	-	-	9	3	-	1	1	9	6	-	51
2	2	24	6	2	-	2	-	-	-	52	-	-	-	8	5	1	-	1	-	8	-	52
2	3	13	8	4	1	3	-	-	-	11	-	-	-	12	2	2	2	2	-	6	1	53
2	3	21	12	134	-	6	-	3	-	88	1	-	-	9	7	2	1	1	-	14	1	54
-	2	20	21	1	-	20	-	-	-	16	-	-	-	9	7	-	-	-	-	9	-	55
1	4	11	8	704	1	23	-	6	-	70	-	-	-	6	2	1	1	-	-	5	-	56
-	-	8	6	3	-	16	-	-	-	24	-	-	-	12	1	-	-	-	-	4	-	57
-	1	44	13	3	-	23	-	-	-	44	1	-	-	8	1	1	1	-	-	27	-	58
1	5	14	6	88	-	208	-	-	-	42	-	2	-	8	3	3	2	2	-	50	1	59
-	2	12	6	594	1	41	-	-	-	81	-	-	-	9	39	-	1	1	-	66	3	60
-	2	13	9	18	-	10	-	1	-	240	3	-	-	6	7	-	-	-	-	2	-	61
5	-	9	5	24	-	14	-	-	-	100	-	3	-	10	1	1	-	-	-	20	-	62
-	-	4	-	-	-	-	-	-	-	117	-	-	-	18	7	-	-	-	-	12	1	63
-	4	6	1	2	-	4	-	-	-	32	1	-	-	8	5	-	3	-	-	-	-	64
-	2	8	4	-	-	6	-	3	-	59	-	-	-	7	2	-	-	1	-	25	2	65
-	1	4	7	-	-	67	-	2	-	62	-	-	1	11	3	1	-	1	1	35	1	66
-	1	10	5	16	-	60	-	1	-	48	-	1	-	23	22	2	4	-	-	78	1	67
-	1	20	2	10	-	9	-	-	-	22	-	1	-	4	4	1	-	-	-	7	-	68
-	2	5	1	-	-	3	-	-	-	55	-	1	-	6	2	3	1	1	-	4	1	69
-	-	1	1	-	-	3	-	-	-	2	-	-	-	8	3	1	4	-	-	2	-	70

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Population estimated as of July 1, 1927.	An- terior Poli- omye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Mening- itis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
76	Andover	11,157	8	1	13	-	-	-	-	-	7	-	-	-
77	Wellesley	10,259	1	-	104	-	-	1	-	-	11	-	7	-
78	Dartmouth	10,111	-	-	26	-	-	9	-	-	-	-	-	-
79	North Attleboro	10,024	3	-	34	-	45	-	-	-	1	-	-	-
80	CITIES AND TOWNS, 5,000-10,000.	378,534	97	11	717	1	264	4	2	-	44	-	112	2
81	Northbridge	9,999	4	-	1	-	2	-	-	-	-	-	-	-
82	Bridgewater	9,909	1	-	48	-	3	-	-	-	10	-	10	-
83	Needham	9,816	1	-	31	-	1	-	-	-	1	-	2	-
84	Stoneham	9,602	1	-	31	-	2	-	-	-	2	-	-	-
85	Athol	9,521	-	-	10	-	1	-	-	-	-	-	3	-
86	Middleboro	9,428	3	-	11	-	4	-	-	-	-	-	-	-
87	Ludlow	9,371	1	-	36	-	57	1	-	-	-	-	1	-
88	Swampscott	9,318	1	-	33	-	13	-	-	-	4	-	5	-
89	Reading	9,231	-	-	-	-	4	-	-	-	-	-	-	-
90	Ware	8,672	-	-	2	-	1	-	-	-	-	-	-	-
91	Marblehead	8,594	-	-	13	-	2	-	-	-	-	-	7	-
92	Lexington	8,397	3	-	54	-	5	-	-	-	5	-	2	-
93	Hudson	8,355	1	1	14	1	1	-	-	-	-	-	-	-
94	Stoughton	8,280	-	-	3	-	2	-	-	-	-	-	-	-
95	Maynard	8,186	1	-	1	-	1	-	-	-	-	-	-	-
96	Whitman	8,159	1	1	-	-	-	-	-	-	1	-	-	-
97	Rockland	8,144	3	-	3	-	-	-	-	-	-	-	-	-
98	Montague	8,099	-	1	-	-	1	-	-	-	-	-	-	-
99	Concord	7,310	-	-	12	-	2	-	-	-	-	-	51	-
100	Franklin	7,293	2	-	15	-	43	-	-	-	7	-	4	-
101	North Andover	7,084	1	-	48	-	-	-	-	-	1	-	-	-
102	South Hadley	7,070	-	-	7	-	1	-	-	-	-	-	-	-
103	Grafton	7,009	-	-	-	-	-	-	-	-	-	-	-	-
104	Walpole	6,962	1	-	31	-	-	-	-	-	1	-	7	-
105	Chelmsford	6,953	5	1	44	-	4	-	-	-	1	-	-	1
106	Draeut	6,877	1	-	-	-	-	-	-	-	-	-	-	-
107	Agawam	6,832	1	-	-	-	3	-	-	-	-	-	-	-
108	Millbury	6,779	2	-	16	-	3	-	-	-	-	-	-	-
109	Spencer	6,777	-	-	4	-	5	-	-	-	-	-	-	-
110	Mansfield	6,734	1	-	10	-	9	-	-	-	1	-	9	-
111	Shrewsbury	6,724	-	-	-	-	8	-	-	-	-	-	-	-
112	Westboro	6,586	-	-	1	-	-	-	-	-	2	-	-	1
113	Uxbridge	6,510	-	-	2	-	1	-	1	-	-	-	-	-
114	Great Barrington	6,443	-	-	7	-	4	-	-	-	2	-	-	-
115	Hingham	6,392	3	-	11	-	1	-	-	-	-	-	-	-
116	Winchendon	6,286	3	1	3	-	1	-	1	-	1	-	-	-
117	Barnstable	6,174	-	-	19	-	3	-	-	-	-	-	-	-
118	Amherst	6,150	8	-	10	-	-	-	-	-	-	-	-	-
119	Wareham	6,098	4	-	3	-	3	-	-	-	-	-	2	-
120	Randolph	6,022	2	-	-	-	2	-	-	-	-	-	-	-
121	Ipswich	5,992	26	2	10	-	-	-	-	-	2	-	7	-
122	Abington	5,923	2	2	-	-	9	-	-	-	-	-	-	-
123	Canton	5,878	3	1	39	-	15	-	-	-	-	-	-	-
124	Easton	5,457	1	-	4	-	18	-	-	-	-	-	-	-
125	Billerica	5,455	1	-	20	-	-	-	-	-	-	-	-	-
126	Somerset	5,374	-	-	-	-	2	1	-	-	-	-	-	-
127	Auburn	5,370	1	1	62	-	4	-	1	-	1	-	1	-
128	Foxboro	5,274	1	-	24	-	-	-	-	-	2	-	1	-
129	Tewksbury	5,212	-	-	-	-	4	-	-	-	-	-	-	-
130	Falmouth	5,205	1	-	24	-	11	1	-	-	-	-	-	-
131	Monson	5,199	-	-	-	-	1	-	-	-	-	-	-	-
132	Orange	5,033	-	-	-	-	-	-	-	-	-	-	-	-
133	Blackstone	5,016	-	-	-	-	8	-	-	-	-	-	-	-
134	TOWNS, 2,500-5,000.	188,354	38	5	307	-	73	4	2	-	20	-	37	1
135	Dudley	4,974	-	-	6	-	1	-	-	-	1	-	-	-
136	Seekonk	4,745	-	-	-	-	5	-	-	-	-	-	-	-
137	Westport	4,675	3	-	2	-	1	-	-	-	1	-	-	-
138	Acushnet	4,589	-	-	3	-	5	-	-	-	-	-	-	-
139	Templeton	4,517	-	-	2	-	-	-	-	-	-	-	-	-
140	Leicester	4,313	1	-	-	-	-	-	-	-	-	-	-	-
141	Dalton	4,236	-	-	-	-	-	-	-	-	-	-	-	-
142	Warren	4,155	-	-	27	-	-	-	-	-	-	-	6	-
143	Williamstown	4,132	-	-	38	-	1	-	-	-	-	-	-	-
144	Oxford	4,112	1	-	-	-	8	-	-	-	1	-	-	-
145	Lee	4,047	1	-	-	-	-	-	-	-	-	-	-	-
146	Medfield	3,984	-	-	2	-	-	-	1	-	-	-	1	-
147	Rockport	3,978	1	1	6	-	1	-	-	-	-	-	-	-
148	Wilmington	3,915	-	-	4	-	1	-	-	-	-	-	-	-
149	Westford	3,742	-	-	4	-	1	-	-	-	-	-	-	-
150	Swansea	3,642	2	1	-	-	1	1	-	-	-	-	-	-

to the Public Health, 1927 — Continued.

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
2	2	8	8	9	-	40	-	-	-	70	-	-	-	9	4	1	1	-	-	22	-	76
-	20	3	32	3	-	126	-	-	-	57	-	-	-	5	1	2	2	-	-	37	-	77
-	5	6	2	2	-	143	-	3	-	18	-	-	-	4	5	3	-	-	-	11	-	78
-	5	4	30	1	-	9	-	2	-	17	-	-	-	6	3	2	2	-	-	2	-	79
8	33	159	140	1073	5	716	-	23	-	1006	11	42	7	268	157	27	22	35	-	590	14	80
1	2	11	3	3	-	6	-	-	-	12	1	-	-	6	6	-	-	-	-	16	3	81
1	1	9	5	4	-	5	-	-	-	40	1	1	1	40	14	2	1	2	-	39	-	82
-	3	6	5	10	-	55	-	-	-	33	1	-	-	5	2	1	1	-	-	6	-	83
-	9	2	20	-	-	15	-	-	-	37	-	1	1	18	2	-	-	-	-	20	1	84
-	1	1	1	4	-	1	-	1	-	22	-	-	-	2	-	-	-	-	-	14	3	85
-	1	4	3	8	-	67	-	2	-	11	2	-	-	13	3	-	-	-	-	15	-	86
-	1	1	3	3	-	7	-	1	-	7	-	3	-	2	2	1	1	-	-	10	1	87
-	1	3	2	127	-	81	-	2	-	57	-	3	-	3	3	-	-	-	-	87	-	88
-	1	3	3	1	-	2	-	-	-	16	-	-	-	5	-	-	1	-	-	-	-	89
-	2	2	1	5	-	-	-	-	-	3	-	-	-	4	5	-	-	-	-	-	2	90
1	-	6	2	6	-	15	-	1	-	28	-	-	-	4	-	2	-	-	-	48	-	91
-	-	6	5	5	-	1	-	-	-	39	1	-	-	17	3	1	1	2	-	6	-	92
-	-	6	6	1	-	2	-	-	-	9	-	-	-	10	2	1	-	-	-	10	-	93
-	1	-	2	1	-	12	-	-	-	20	-	-	-	2	2	1	-	-	-	8	-	94
-	1	1	1	9	-	-	-	-	-	29	-	-	-	9	4	1	2	-	-	-	-	95
1	4	1	1	3	-	3	-	-	-	11	-	-	-	2	1	-	-	-	-	3	-	96
1	1	1	6	4	-	4	-	-	-	65	-	-	-	11	5	2	-	-	-	9	-	97
2	1	1	3	4	-	2	-	-	-	2	-	-	-	2	2	-	-	-	-	-	-	98
1	2	6	1	187	1	3	-	-	-	31	3	19	-	2	1	-	5	-	-	1	1	99
1	1	2	2	108	-	11	-	2	-	20	-	-	-	9	2	-	-	-	-	7	-	100
-	1	2	4	5	-	26	-	1	-	8	-	2	-	1	2	-	1	-	-	38	-	101
-	1	4	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	102
-	12	-	25	-	-	76	-	3	-	24	-	1	-	8	2	1	2	-	-	31	-	103
-	10	3	3	-	-	26	-	1	-	13	-	-	-	8	2	1	2	-	-	32	-	104
-	1	2	-	-	-	-	-	-	-	2	-	1	-	2	5	-	1	-	-	-	-	105
-	1	1	-	-	-	-	-	-	-	5	-	-	-	2	3	1	2	1	-	-	-	106
-	2	4	2	-	-	3	-	1	-	18	-	-	-	2	1	-	-	-	-	10	-	107
-	5	3	-	-	-	8	-	-	-	6	-	-	-	4	2	-	-	-	-	4	-	108
-	4	2	8	-	-	7	-	-	-	10	-	3	-	3	1	1	1	-	-	4	-	109
-	1	1	1	-	-	-	-	-	-	4	-	-	-	1	1	-	-	-	-	-	-	110
-	1	1	7	-	-	6	-	-	-	31	-	-	-	14	12	-	-	-	-	-	-	111
-	1	1	1	-	-	4	-	-	-	-	-	-	-	1	1	1	2	1	-	-	-	112
-	5	3	76	-	-	14	-	-	-	10	1	1	-	1	1	-	-	-	-	5	-	113
-	4	3	6	-	-	2	-	-	-	11	-	-	-	7	2	-	-	-	-	36	-	114
-	1	2	4	-	-	-	-	-	-	33	-	-	-	3	3	-	-	-	-	7	1	115
-	3	2	1	-	-	18	-	1	-	31	-	-	-	3	1	-	-	-	-	7	-	116
-	4	2	294	-	-	9	-	2	-	16	-	-	-	2	2	-	2	-	-	29	-	117
-	1	1	4	-	-	6	-	-	-	7	-	-	-	3	3	-	-	-	-	17	-	118
-	4	4	3	-	-	22	-	-	-	30	-	7	1	3	2	1	-	-	-	16	-	119
-	2	2	2	-	-	11	-	-	-	50	-	-	-	1	1	1	-	-	-	4	-	120
-	1	4	3	-	-	22	-	-	-	11	-	-	-	5	-	-	-	-	-	-	-	121
-	2	2	5	-	-	26	-	-	-	9	-	-	-	7	1	3	1	-	-	11	-	122
-	12	4	6	-	-	42	-	-	-	22	-	-	-	1	7	-	2	-	-	15	-	123
-	1	3	3	-	-	33	-	-	-	9	-	-	-	1	5	-	-	-	-	11	-	124
-	1	3	1	-	-	46	-	1	-	14	-	1	-	2	2	-	-	-	-	3	-	125
1	1	3	2	35	1	34	-	1	-	4	-	-	1	3	3	1	-	-	-	1	-	126
-	-	-	40	-	-	9	-	-	-	4	-	-	-	4	1	1	2	-	-	-	1	127
-	1	3	-	-	-	-	-	-	-	7	-	-	-	4	1	1	1	-	-	13	-	128
-	1	5	-	-	-	-	-	2	-	6	-	-	-	4	1	2	-	-	-	-	-	129
-	4	4	-	-	-	-	-	-	-	1	-	-	-	-	2	1	1	-	-	-	-	130
12	19	55	73	239	4	270	1	2	-	585	3	18	-	119	78	9	17	16	1	163	3	131
-	-	1	-	-	-	21	-	-	-	3	-	-	-	5	1	-	-	1	-	7	-	132
2	-	-	1	-	1	16	-	-	-	7	-	-	-	8	1	1	-	-	-	1	-	133
-	-	-	1	-	-	-	-	1	-	11	-	-	-	4	-	1	2	-	-	-	-	134
-	-	-	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	9	-	135
-	1	-	-	-	-	-	-	1	-	3	-	-	-	-	4	-	-	-	-	-	-	136
-	6	-	-	-	-	1	-	-	-	8	-	-	-	-	1	-	-	-	-	-	-	137
-	1	3	-	-	-	27	-	-	-	21	-	1	-	2	1	-	-	1	-	14	-	138
-	2	-	1	-	-	20	-	-	-	9	-	-	-	2	1	-	-	-	-	-	-	139
-	-	-	1	-	-	-	-	-	-	1	-	-	-	2	1	-	-	-	-	-	-	140
-	-	-	-	-	-	-	-	-	-	6	-	-	-	2	1	-	-	-	-	-	-	141
-	-	-	-	-	-	-	-	-	-	11	-	-	-	4	12	1	1	-	-	-	-	142
-	-	-	-	-	-	-	-	-	-	44	-	-	-	2	4	-	-	-	-	2	-	143
-	-	-	-	-	-	-	-	-	-	20	-	-	-	2	-	-	-	-	-	5	-	144
-	-	-	-	-	-	-	-	-	-	3	-	-	-	4	1	-	-	-	-	8	-	145
-	-	-	-	-	-	-	-	-	-	11	-	-	-	2	2	-	-	-	-	-	-	146
-	-	-	-	-	-	-	-	-	-	44	-	-	-	4	12	1	1	-	-	-	-	147
-	-	-	-	-	-	-	-	-	-	20	-	-	-	2	-	-	-	-	-	-	-	148
-	-	-	-	-	-	-	-	-	-	3	-	-	-	4	1	-	-	-	-	-	-	149
-	-	-	-	-	-	-	-	-	-	11	-	-	-	3	2	-	-	-	-	3	-	150

to the Public Health, 1927 — Continued.

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
-	-	1	8	1	-	11	7	-	-	4	1	-	-	1	1	1	2	1	3	1	-	151
-	-	1	5	1	-	1	1	-	-	3	3	-	-	2	3	1	1	-	28	-	-	152
-	1	2	1	1	-	1	-	-	-	13	-	-	-	2	1	-	-	-	24	-	-	153
-	-	1	2	1	-	1	-	-	-	6	1	-	-	2	1	-	-	-	-	-	-	154
-	-	1	2	1	-	4	-	-	-	4	-	1	-	3	2	-	-	-	-	-	-	155
-	-	1	2	1	34	18	4	-	-	8	-	-	-	20	9	1	1	-	-	1	-	156
-	1	1	6	108	1	60	2	-	-	38	6	1	-	15	10	2	1	-	-	1	-	157
-	1	1	5	1	-	2	-	-	-	6	-	-	-	4	-	-	-	1	-	3	-	158
-	2	2	-	-	-	7	-	-	-	102	-	-	-	2	-	-	-	-	-	-	-	159
-	-	-	1	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160
-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	161
-	-	2	2	-	-	-	-	-	-	-	-	-	-	2	1	1	-	-	-	-	-	162
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	163
-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	164
-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	165
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	166
-	-	-	-	-	-	3	-	-	-	15	9	-	-	1	1	-	-	-	-	-	-	167
1	-	-	6	-	5	14	-	-	-	9	8	-	-	2	1	1	1	1	2	5	-	168
-	-	1	2	2	5	-	-	-	-	4	-	-	-	4	-	1	-	-	-	-	-	169
-	-	-	2	2	-	-	-	1	-	41	1	-	-	3	1	-	-	-	-	1	-	170
-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	171
-	-	-	-	-	-	1	-	-	-	15	3	-	-	-	2	1	-	-	-	1	-	172
-	-	-	3	3	-	8	-	-	-	3	-	-	1	1	1	-	-	-	-	-	-	173
-	-	-	1	1	4	2	-	-	-	4	-	1	-	1	1	-	-	-	-	1	-	174
-	-	-	12	5	5	1	-	-	-	31	3	-	-	2	1	-	-	-	-	-	-	175
-	-	-	1	1	7	3	-	-	-	3	2	-	-	1	-	-	-	-	-	1	-	176
5	-	-	1	1	1	9	-	-	-	10	11	-	-	1	-	-	-	1	-	3	-	177
-	-	2	1	1	-	-	-	-	-	11	3	-	-	3	-	-	-	-	-	-	-	178
-	-	-	1	-	1	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	179
-	1	-	3	1	1	28	-	-	-	3	3	-	-	-	-	1	-	-	-	-	-	180
-	-	2	1	1	19	-	-	-	-	8	3	10	-	2	1	-	-	-	-	20	-	181
-	-	-	1	1	2	-	-	-	-	3	3	-	-	4	1	-	-	-	-	1	-	182
-	-	-	-	-	9	6	-	-	-	10	3	-	-	2	1	-	-	-	-	5	-	183
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-	-	-	1	1	1	-	-	-	-	9	5	-	-	-	-	-	1	-	-	1	-	186
-	-	-	1	1	1	-	-	-	-	5	9	-	-	-	-	-	-	1	-	-	-	187
12	23	58	65	589	4	423	-	10	-	465	4	6	4	98	428	2	25	25	1	12	4	188
-	-	1	3	4	-	1	-	-	-	5	4	-	-	1	-	-	-	-	-	215	-	189
-	-	-	-	6	-	1	-	-	-	4	-	-	-	-	-	-	-	-	-	2	-	190
-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	191
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-	-	-	-	-	-	-	-	-	-	4	-	-	-	214	-	3	-	-	-	-	-	193
-	-	2	1	-	-	2	-	-	-	11	3	-	-	1	-	-	-	1	-	4	-	194
-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	34	-	195
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	196
-	-	2	1	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	197
-	-	-	1	-	-	-	-	-	-	3	3	-	-	-	-	1	-	-	-	-	-	198
1	-	3	2	10	6	1	-	-	-	5	2	-	-	1	2	-	-	2	-	10	-	199
-	-	3	2	11	1	79	-	1	-	22	2	-	-	1	2	-	-	2	-	1	-	200
-	-	-	2	2	-	-	-	-	-	2	1	-	-	10	38	-	1	-	-	4	-	201
-	-	1	2	1	-	-	-	-	-	1	1	-	-	-	1	-	1	-	-	-	-	202
-	-	-	2	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	203
-	-	-	1	-	-	-	-	-	-	32	-	-	-	-	3	-	-	-	-	-	-	204
-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	205
-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	206
-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	207
-	-	-	-	-	-	1	-	-	-	1	4	-	-	1	-	-	-	-	-	3	-	208
-	-	1	2	41	1	4	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	209
-	-	1	1	-	-	-	-	-	-	3	-	-	-	2	3	-	3	-	-	1	-	210
-	-	-	-	-	-	-	-	-	-	7	-	-	-	1	-	-	-	-	-	12	-	211
-	-	-	2	19	1	-	-	-	-	4	-	-	-	1	-	-	-	-	-	4	-	212
-	-	-	2	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	213
-	-	-	1	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	214
-	-	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	215
-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	216
-	-	-	-	-	-	7	-	-	-	5	-	-	-	1	1	-	-	-	-	18	-	217
-	1	-	-	-	8	-	-	-	-	-	-	-	-	1	1	-	-	-	-	3	-	218
-	-	-	-	-	5	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	219
-	-	-	-	-	-	-	-	-	-	2	9	-	-	2	2	-	-	-	-	2	-	220
-	-	-	-	-	-	-	-	-	-	9	-	-	1	-	93	-	-	-	-	1	-	221
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	-	222
-	-	-	-	-	-	-	-	-	-	3	-	-	-	2	2	-	-	-	-	-	-	223
-	-	1	1	-	-	93	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	224
-	-	1	1	-	-	1	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	225

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1	-	-	2	1	-	1	-	1	-	15	-	-	-	1	3	-	-	1	-	7	-	226
-	-	1	3	2	-	2	-	-	-	9	-	-	-	1	1	-	-	2	-	1	-	227
2	-	-	1	-	-	3	-	-	-	8	-	-	-	2	2	-	-	-	-	-	-	228
1	-	-	-	-	-	5	-	-	-	2	-	1	-	1	1	-	-	-	-	-	-	229
-	-	1	-	-	-	-	-	-	-	2	-	-	-	2	2	-	-	-	-	1	-	230
-	-	2	-	-	-	-	-	-	-	2	-	-	-	1	3	-	-	-	-	-	-	231
1	-	-	-	-	-	-	-	-	-	2	-	-	-	2	1	-	-	1	1	5	-	232
-	-	-	-	-	-	-	-	-	-	7	-	-	-	3	3	-	-	-	-	-	-	233
-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-	1	-	234
-	-	1	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	1	-	-	-	235
-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	236
-	-	1	-	-	-	2	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	237
-	-	2	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	6	-	238
-	-	-	-	-	-	-	-	-	-	12	-	-	-	-	1	-	-	-	-	-	-	239
-	-	-	-	-	-	5	-	-	-	10	-	-	-	2	1	-	-	-	-	-	-	240
-	-	-	-	-	-	-	-	-	-	3	-	-	-	5	1	-	-	-	-	7	-	241
-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	242
-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	243
-	-	1	-	-	-	8	-	-	-	5	-	-	-	3	2	-	-	1	-	-	-	244
-	-	-	-	-	-	1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	245
-	-	-	-	-	-	2	-	-	-	7	-	1	-	1	-	-	-	-	-	-	-	246
-	-	-	-	-	-	6	-	-	-	1	-	-	-	-	-	-	-	-	-	9	-	247
-	-	-	-	-	-	3	-	-	-	3	-	-	-	-	1	-	-	1	-	-	-	248
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	249
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	250
-	-	1	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	251
-	-	-	-	-	-	-	-	-	-	1	-	-	-	20	3	-	-	-	-	-	-	252
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	253
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	254
-	-	-	-	-	-	2	-	-	-	1	-	1	-									

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation estimated as of July 1, 1927.	An- terior Polio- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
301	Wellfleet	770	-	-	-	-	-	-	-	-	-	-	-	-
302	Enfield	733	-	-	-	-	-	-	-	-	-	-	-	-
303	Petersham	683	-	-	5	-	-	-	-	-	-	-	-	-
304	Dana	682	-	-	-	-	-	-	-	-	-	-	-	-
305	Sherborn	661	-	-	4	-	-	-	-	-	-	-	-	-
306	Leverett	653	-	-	1	-	-	-	-	-	1	-	-	-
307	Richmond	644	-	-	-	-	-	-	-	-	-	-	-	-
308	Halifax	636	-	-	-	-	-	-	-	-	-	-	-	-
309	Hampden	634	-	-	3	-	1	-	-	-	-	-	-	-
310	Paxton	634	-	-	-	-	-	-	-	-	-	-	-	-
311	Harvard	627	-	-	1	-	-	-	-	-	-	-	-	-
312	Granville	591	-	-	-	-	-	-	-	-	-	-	-	-
313	Boxford	581	-	-	-	-	-	-	-	-	1	-	-	-
314	Oakham	543	-	-	-	-	-	-	-	-	-	-	-	-
315	Hancock	528	-	-	5	-	1	-	-	-	-	-	1	-
316	Carlisle	528	-	-	-	-	-	-	-	-	-	-	-	-
317	Plympton	527	-	-	-	-	-	-	-	-	-	-	-	-
318	Pelham	524	-	-	-	-	2	-	-	-	-	-	-	-
319	New Salem	521	-	-	-	-	-	-	-	-	-	-	-	-
320	Eastham	521	-	-	-	-	-	-	-	-	-	-	-	-
321	Cummington	517	-	-	6	-	-	-	-	-	-	-	-	-
322	Egremont	491	-	-	2	-	-	-	-	-	-	-	-	-
323	Sandisfield	489	-	-	-	-	-	-	-	-	-	-	-	-
324	Truro	486	-	-	5	-	-	-	-	-	-	-	-	-
325	Greenwich	472	-	-	-	-	-	-	-	-	-	-	-	-
326	Chesterfield	445	-	-	11	-	-	-	-	-	-	-	-	-
327	Wales	439	-	-	-	-	-	-	-	-	-	-	-	-
328	Worthington	438	-	-	-	-	-	-	-	-	-	-	-	-
329	New Braintree	434	-	-	-	-	-	-	-	-	-	-	-	-
330	Blandford	421	-	-	2	-	-	-	-	-	-	-	-	-
331	Wendell	419	-	-	-	-	-	-	-	-	-	-	-	-
332	Otis	409	-	-	-	-	-	-	-	-	-	-	-	-
333	Phillipston	395	-	-	-	-	-	-	-	-	-	-	1	-
334	Florida	389	-	-	-	-	-	-	-	-	-	-	-	-
335	Savoy	385	-	-	-	-	-	-	-	-	-	-	-	-
336	Windsor	383	-	-	-	-	-	-	-	-	-	-	-	-
337	Warwick	378	-	-	-	-	-	-	-	-	-	-	-	-
338	Monterey	375	-	-	-	-	-	-	-	-	-	-	-	-
339	Westhampton	351	-	-	-	-	-	-	-	-	-	-	-	-
340	Boxboro	347	-	-	-	-	-	-	-	-	-	-	-	-
341	Hawley	340	-	-	-	-	-	-	-	-	-	-	-	-
342	Dunstable	333	1	1	-	-	-	-	-	-	-	-	-	-
343	West Tisbury	327	-	-	-	-	-	-	-	-	-	-	-	-
344	Mashpee	320	-	-	-	-	-	-	-	-	-	-	-	-
345	Heath	287	-	-	-	-	-	-	-	-	-	-	-	-
346	Tyringham	285	-	-	-	-	-	-	-	-	-	-	-	-
347	Rowe	276	-	-	-	-	1	-	-	-	-	-	-	-
348	Plainfield	264	-	-	-	-	-	-	-	-	-	-	-	-
349	Goshen	262	-	-	-	-	-	-	-	-	-	-	-	-
350	Leyden	245	-	-	-	-	3	-	-	-	-	-	-	-
351	Chilmark	240	-	-	-	-	-	-	-	-	-	-	-	-
352	Washington	231	-	-	-	-	-	-	-	-	-	-	-	-
353	Prescott	230	-	-	-	-	-	-	-	-	-	-	-	-
354	Alford	210	-	-	-	-	-	-	-	-	-	-	-	-
355	Middlefield	198	-	-	-	-	-	-	-	-	-	-	-	-
356	Shutesbury	194	-	-	-	-	-	-	-	-	-	-	-	-
357	Montgomery	189	-	-	-	-	-	-	-	-	-	-	-	-
358	Gay Head	177	-	-	-	-	-	-	-	-	-	-	-	-
359	Gosnold	144	-	-	-	-	-	-	-	-	-	-	-	-
360	Holland	139	-	-	-	-	-	-	-	-	-	-	-	-
361	Tolland	134	-	-	-	-	-	-	-	-	-	-	-	-
362	Monroe	132	-	-	-	-	-	-	-	-	-	-	-	-
363	Peru	99	-	-	-	-	-	-	-	-	-	-	-	-
364	New Ashford	84	-	-	-	-	-	-	-	-	-	-	-	-
365	Mount Washington	53	-	-	-	-	-	-	-	-	-	-	-	-
366	Tewksbury State Infirmary	-	-	-	7	1	3	-	1	-	-	-	44	-

to the Public Health, 1927 — Concluded.

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
2	-	-	-	-	-	4	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	301
-	-	-	-	4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	302
-	-	1	-	4	-	81	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	303
-	-	-	-	15	-	-	-	-	-	9	1	-	-	-	-	-	-	1	-	1	-	304
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	305
-	-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	306
-	-	-	2	1	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	307
-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	308
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	309
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	310
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	311
-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	312
-	1	-	-	26	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	313
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314
1	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	315
-	-	2	-	-	-	2	-	-	-	-	-	-	-	1	-	2	-	-	-	4	-	316
-	-	-	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	317
-	-	-	-	1	-	-	-	-	-	3	-	-	-	1	1	-	-	-	-	-	-	318
-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	319
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	320
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	321
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	322
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	323
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	324
-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	325
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	328
-	-	-	-	7	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	329
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	330
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	331
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	332
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	333
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	334
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	335
-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	336
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-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	354
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	355
-	-	-	-	38	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	356
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	357
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	358
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	360
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	361
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	362
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	363
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	364
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	365
5	-	8	11	-	-	-	-	-	-	5	-	18	7	40	82	4	1	-	-	-	-	366

In addition to the foregoing there occurred 3 cases of *actinomycosis* with 3 deaths.

	Cases.	Deaths.
Boston	2	3
Quincy	1	—

5 cases of *anthrax*:

Haverhill	2	—
Lowell	1	—
Lynn	2	—

378 cases of *dog bite*:

Andover	1	—
Arlington	11	—
Attleboro	2	—
Belmont	1	—
Billerica	10	—
Boston	74	—
Braintree	1	—
Brockton	3	—
Brookline	6	—
Cambridge	5	—
Canton	1	—
Chelmsford	9	—
Chelsea	5	—
Danvers	11	—
Dedham	2	—
Everett	13	—
Fall River	2	—
Hingham	4	—
Holyoke	8	—
Hudson	1	—
Lee	1	—
Lincoln	1	—
Lowell	37	—
Lynn	3	—
Malden	3	—
Mansfield	1	—
Marlborough	3	—
Medford	21	—
Melrose	3	—
Milton	12	—
Natick	8	—
Newton	7	—
North Andover	3	—
Northbridge	5	—
Norwell	2	—
Peabody	18	—
Quincy	10	—
Rehoboth	1	—
Revere	16	—
Salem	23	—
Somerville	5	—
Springfield	3	—
Stoughton	5	—
Waltham	1	—
Watertown	2	—
Weston	1	—
Weymouth	3	—
Winchester	2	—
Winthrop	8	—

14 cases of *dysentery* with 7 deaths:

Belchertown	—	1
Boston	11	4
Chelsea	—	1
Everett	1	—
Salem	1	1
Worcester	1	—

79 cases of *encephalitis lethargica* with 61 deaths:

Adams	1	2
Arlington	2	1
Attleboro	1	—
Belmont	1	—
Boston	17	13
Brockton	1	1
Bridgewater	—	1
Cambridge	2	1
Chelsea	1	—
Chicopee	1	1
Dighton	1	1
Everett	2	—
Fall River	5	5
Holyoke	—	1
Longmeadow	—	1
Lowell	—	1

	Cases.	Deaths.
Lynn	5	3
Ludlow	1	—
Malden	4	—
Mansfield	1	1
Methuen	1	1
New Bedford	3	1
Newburyport	1	—
Newton	—	3
Northampton	5	7
Peabody	1	1
Pittsfield	3	2
Quincy	2	2
Salem	2	1
Somerville	4	1
Southbridge	—	1
Springfield	1	1
Stoneham	1	1
Swampscott	1	—
Tewksbury State Infirmary	—	1
Waltham	3	—
Webster	—	1
West Springfield	1	1
Worcester	4	3

551 cases of *hilum tuberculosis*:

Arlington	3	—
Ashburnham	1	—
Ashby	2	—
Attleboro	4	—
Beverly	1	—
Bolton	1	—
Boston	219	—
Bridgewater	1	—
Brockton	8	—
Brookline	9	—
Cambridge	51	—
Chelsea	33	—
Chicopee	1	—
Clinton	3	—
Dighton	3	—
East Longmeadow	1	—
Everett	2	—
Fall River	18	—
Fitchburg	6	—
Freetown	1	—
Gloucester	8	—
Haverhill	14	—
Hudson	5	—
Lancaster	5	—
Leominster	4	—
Lexington	1	—
Lynn	8	—
Malden	4	—
Marblehead	1	—
Maynard	5	—
Medford	2	—
Medway	2	—
Melrose	7	—
Methuen	3	—
Middleboro	2	—
Milford	1	—
Millbury	5	—
Newton	1	—
North Adams	2	—
Oxford	6	—
Pittsfield	8	—
Quincy	1	—
Revere	3	—
Rutland	8	—
Somerville	8	—
Southwick	2	—
Springfield	34	—
Stoneham	11	—
Stow	1	—
Townsend	1	—
Wakefield	1	—
Waltham	12	—
Watertown	1	—
West Boylston	4	—
West Brookfield	1	—
Westport	1	—

9 cases of *malaria* with 1 death:

Boston	4	—
Brockton	2	1
Chelmsford	1	—
Lowell	1	—
Salem	1	—

Cases. Deaths.

15 cases of *pellagra* with 10 deaths:

Boston	9	4
Bridgewater	1	1
Holyoke	1	—
Melrose	1	—
New Bedford	1	—
Northampton	1	1
Waltham	1	1
Ware	1	1
Westboro	—	1
Worcester	—	1

2 cases of *rabies* with 2 deaths:

Stoughton	1	1 ¹
Westford	1	1 ²

141 cases of septic sore throat
with 50 deaths:

Amherst	1	—
Arlington	1	1
Attleboro	—	1
Beverly	3	1
Boston	73	22
Bridgewater	1	1
Brockton	1	1
Brookline	2	—
Cambridge	5	—
Canton	1	—
Chelsea	1	—
Chelmsford	1	—
Dracut	—	1
Everett	2	—
Fall River	16	2
Frammingham	1	1
Greenfield	2	—
Haverhill	—	1
Holliston	1	—
Holyoke	—	1
Hopedale	1	—
Ipswich	1	—
Leominster	1	—
Lowell	1	—
Lynn	1	1
Mansfield	2	—
Medford	2	—
Medway	—	1
New Bedford	2	—
Newton	1	1
Northampton	1	—
Quincy	2	—
Rockland	—	1

¹ Died in a Boston Hospital.² Died in a Worcester Hospital.

Cases. Deaths.

Salisbury	1	—
Saugus	1	—
Somerville	—	3
Spencer	1	—
Springfield	1	4
Taunton	1	—
Wakefield	1	1
Ware	—	1
Watertown	1	—
Westboro	—	1
West Springfield	1	—
Williamsburg	1	—
Worcester	6	3

2 cases of *smallpox*:

Plainville	1	—
Pittsfield	1	—

25 cases of *tetanus* with 23 deaths:

Amherst	1	—
Barnstable	—	1
Boston	5	4
Brockton	2	2
Cambridge	1	1
Conway	—	1
Fall River	1	1
Greenfield	2	2
Haverhill	1	1
Lowell	1	—
Lynn	1	1
Natick	1	—
New Bedford	3	1
Northampton	2	3
North Attleboro	1	—
Palmer	—	1
Peabody	—	1
Pittsfield	—	1
Springfield	1	1
Stockbridge	1	—
Walpole	1	—
Worcester	—	1

33 cases of *trachoma*:

Boston	21	—
Cambridge	4	—
Chelsea	1	—
Everett	1	—
Fall River	2	—
Haverhill	1	—
Lowell	1	—
New Bedford	1	—
Plymouth	1	—

1 death from *trichinosis*:

Springfield	—	1
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REPORT OF DIVISION OF BIOLOGIC LABORATORIES.

BENJAMIN WHITE, Ph.D., *Director.*

ELLIOTT S. ROBINSON, M.D., *Assistant Director.*

I. ANTITOXIN AND VACCINE LABORATORY.

1. *New Buildings.*

The most important event in the past year has been the erection and occupation of sizeable additions to the laboratory and stable buildings. Because of the increased demand made upon this laboratory for biologic products, the need for additional accommodations had become imperative. By a very fortunate arrangement with Harvard University, a sum of money was appropriated for the construction of these buildings, and the Commonwealth made an appropriation of \$29,500 for the purchase and installation of new equipment. The buildings as erected practically double the capacity of the laboratory and give about fifty per cent additional space in the stable. The laboratory building was so planned that the work of each function or each department could be segregated into an individual unit and this plan has reduced considerably the amount of labor necessary to take care of the increased production of serums and vaccines. The appropriation for equipment made it possible to outfit each room almost completely and this has done much to do away with overcrowding of rooms and unnecessary delays in carrying out various processes.

The additional stable space gives seventeen more stalls which will provide for more producing animals for some time to come.

Other features worthy of mention are the provision for the first time for suitable lunch and rest rooms, for a library, for a more commodious business office, for adequate store rooms and for proper refrigerating facilities. All the refrigeration in the building, both in separate ice boxes and in three cold storage rooms is done electrically at a cost smaller than the former cost of ice and the previous packing, transportation and storage charges for all products which had to be kept at low temperatures. Another desirable feature is a lecture room accommodating about forty students, which is being used for classes from the Harvard School of Public Health and for demonstrations. The whole plant as it exists today is modern, fireproof, thoroughly equipped with the latest apparatus and with many devices for saving labor. It, therefore, is not only an ideal manufacturing plant but is well adapted for the accommodation of research students and for demonstration and teaching.

As in past years the Commonwealth leases these buildings from Harvard College.

2. *Distribution of Products.*

The following table shows the amounts of the various products distributed each year for the past five years:

PRODUCT.	1923.	1924.	1925.	1926.	1927.
Diphtheria Antitoxin, 1,000 unit doses	411,507	442,905	370,412	296,591	346,212
Antimeningococcic Serum, 15 cc. doses	4,609	3,949	3,262	2,451	2,837
Antipneumococcic Serum, 100 cc. doses	336	335	256	247	185
Antipneumococcic Serum, bulk cc.	—	—	278,600	215,750	213,490
Smallpox Vaccine Virus, capillary tubes	197,767	249,090	273,153	298,834	294,983
Typhoid-Paratyphoid Vaccine, 1 cc. doses	60,976	65,512	90,776	88,842	108,387
Schick Outfits, 50 doses each	5,875	6,427	5,403	5,031	5,492
Diphtheria toxin (bulk) cc.	170	140	515	350	630
Diphtheria Toxin-Antitoxin Mixture, 1 cc. doses	174,589	309,294	171,405	205,589	332,463
Scarlet Fever Streptococcus Antitoxin, doses	—	—	319	3,712	6,114
Normal Serum, cc.	7,670	39,415	20,290	9,865	23,585
Silver Nitrate Solution (ampoules)	—	—	—	—	12,148
Anti-Measles Diplococcus Serum, bottles	—	—	—	—	104
Influenza Serum, bottles	—	—	—	—	26

(a) *Diphtheria Antitoxin.* — The increase in the amount of diphtheria antitoxin distributed over the previous year is the expected result of the increased prevalence of the disease. The lessened demand during the past two years has enabled this laboratory to build up reserve stocks of concentrated diphtheria antitoxin and to give these stocks a longer ageing. This ageing process results in a product which causes a smaller number of cases of serum sickness.

(b) *Antimeningococcic Serum*. — The number of packages of this product distributed shows a slight increase over 1926, but still remains small owing to the low prevalence of meningococcus meningitis.

(c) *Antipneumococcic Serum*. — A further decrease is shown in the amount of this product distributed. This decrease is accounted for by the fact that many of the Type I cases of lobar pneumonia are now being treated by the concentrated product developed by Dr. Felton of the Harvard School of Medicine. This laboratory, however, has produced approximately the same amount of this serum as in 1926 and instead of its being distributed from this laboratory for treatment it has been supplied to Dr. Felton for concentration.

(d) *Smallpox Vaccine Virus*. — The distribution of this product is at approximately the same high level as it was in 1926 and is well above all previous years with the exception of 1926. Improvements have been made both in the rooms and in the equipment devoted to the preparation of this product.

(e) *Typhoid-paratyphoid Vaccine*. — The amount of this product distributed constitutes a high record. The increased distribution is largely due to the demands made upon this laboratory to supply the inundated areas in the South following the Mississippi flood and the parts of western Massachusetts and Vermont flooded during the autumn of 1927.

(f) *Schick Outfits*. — There has been a slight increase over 1926 in the number of Schick outfits sent out, but the general practice of omitting a Schick test preliminary to toxin-antitoxin immunization has resulted in a lessened demand for this product when compared with such years as 1923 and 1924. Mention should be made here of the tendency on the part of those conducting diphtheria prevention campaigns or clinics to omit a Schick test six months after toxin-antitoxin injections. This practice is to be deprecated and efforts should be made to impress upon those doing this work the necessity of these final Schick tests.

(g) *Diphtheria Toxin in Bulk*. — In addition to the Schick outfits an increased amount of diphtheria toxin has been distributed for experimental purposes.

(h) *Diphtheria Toxin-Antitoxin Mixture*. — There has been over a fifty per cent increase in the amount of this product sent out over that of 1926. This is the greatest amount distributed in any year from this laboratory, and is a most encouraging sign of the increased interest in the active immunization of children against diphtheria.

(i) *Scarlet Fever Streptococcus Antitoxin*. — This product is still fulfilling the promise which its early use held forth. Favorable reports continue to be received concerning its efficacy in the treatment of scarlet fever. In 1927 over 6,000 minimum therapeutic doses were distributed against 3,712 in 1926, and the demand is still so great that it has not yet been possible to supply local boards of health and other distributing stations with reserve stocks. It is, however, sent out to any hospital or any physician who applies for it for immediate use. Efforts have been made to discourage the use of this antitoxin for prophylactic immunization of contacts unless the contacts are not under continued observation.

(j) *Normal Serum*. — There has been a large increase over 1925 and 1926 in the amount of normal serum distributed. This serum is used largely in the medical schools for experimental purposes, many of which have to do with studies resulting in data of value to this laboratory.

While no record is made in this report of either whole blood, blood clots or citrated red blood corpuscles, large amounts of these products, which are either by- or waste products and of no value, are distributed to investigators in the various medical schools and other laboratories.

(k) *Silver Nitrate Solution*. — Following the discontinuance of the Arsphenamine Laboratory, this laboratory took over on August 29, 1927, from the Division of Food and Drugs the manufacture and distribution of silver nitrate solution in wax ampoules. The manufacture of these ampoules effects a considerable saving in money to the Commonwealth.

(l) *Anti-Measles-Diplococcus Serum*. — Working in conjunction with Dr. Ruth Tunnickliff of Chicago, one horse has been immunized with the organism isolated from measles cases which Dr. Tunnickliff believes to be the probable cause of measles. This serum has been concentrated and subjected to various laboratory tests by

Dr. Tunnicliff which show that it contains antibodies against this measles diplococcus. This concentrated serum is being given out to a few hospitals and its use in aborting or preventing measles is being studied.

(m) *Influenza Serum*.—Working in co-operation with Professor Hans Zinsser of the Harvard Medical School a horse has been immunized against the Pfeiffer bacillus and the serum is being studied by Professor Zinsser in his laboratory.

3. Expenses.

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1923	\$35,620.00	\$35,229.51	\$30,002.56	\$30,001.73	\$65,622.56	\$65,231.24
1924	41,000.00	40,983.18	34,065.81	33,900.28	75,065.81	74,883.46
1925	43,200.00	42,507.56	34,648.52	33,342.18	77,848.52	75,849.74
1926	46,000.00	45,025.29	31,184.94	30,747.71	77,184.94	75,773.00
1927	50,355.00	50,261.54	34,611.11	34,579.87	84,966.11	84,841.41
1927*	—	—	29,500.00	29,488.68	29,500.00	29,488.68

*Special Appropriation for purchase and installation of equipment.

The increased amounts for personal services are due to the very gratifying increases in salaries. The increases granted under the reclassification plan have corrected certain injustices and represent more adequate compensation for services rendered. The members of the professional staff are still underpaid and if the present most satisfactory organization is to be maintained, further and substantial increases will be necessary. The increase in the expenses is due to increased rent and to larger operating costs called for by the new buildings.

4. Improvements.

In addition to the new buildings, the rooms of the old buildings have been repainted, new floors laid and many other improvements made adding to the convenience and ease of up-keep of the building. Various new devices have been installed which further control sterilizing and refrigerating apparatus.

5. Personnel.

The position of Assistant Bacteriologist (Veterinarian) made vacant by the resignation of Dr. Gerald F. O'Malley was filled on June 6, by the appointment of Dr. James A. McComb, a graduate of Ohio State University. With the appointment of Dr. William E. Bunney on June 20, we now have a Senior Chemist. Dr. Bunney is a graduate of the University of Montana and received his degree of Doctor of Philosophy from the University of Illinois. He now has direction of all chemical procedures in the laboratory, and in addition, is engaged in research work on problems related to the production of serums and vaccines. The increased laboratory and stable accommodations have required the appointment of an additional janitor who is also a receiving clerk and storekeeper, an extra cleaning woman and one additional stableman. The assumption of the manufacture of silver nitrate ampoules has required the transfer of a laboratory helper from the Division of Food and Drugs to this laboratory. With the increase in production a still greater expansion will be necessary, but it is hoped to limit the personnel to the minimum number of employees necessary to carry out the work successfully. The personnel at present is made up as follows: 1 Director, 1 Assistant Director, 2 Senior Bacteriologists, 1 Senior Chemist, 1 Assistant Bacteriologist, 1 Assistant Chemist, 1 Junior Bacteriologist, 1 Senior Clerk and Stenographer, 1 Senior Clerk, 1 Junior Clerk and Stenographer, 3 Laboratory Assistants, 9 Laboratory Helpers, 13 Laborers, 2 Janitors, 1 Stable Foreman.

6. Reclassification.

The recent reclassification of personnel gives much fairer grading of employees than existed previously, but the maximum salaries set for the higher grades are still too low to make it possible either to attract or to hold the high type of experienced, skillful and trustworthy workers required in this highly specialized branch of scientific work. In such an organization as this it is essential that every effort

be made to provide for the permanency of the professional staff, and this can only be done by paying higher salaries.

7. *Educational Activities.*

Teaching. — With the new class room it is now possible to carry on instruction to larger classes than formerly. The resources of this laboratory are being more fully utilized by teaching institutions, particularly the Schools of Medicine and Public Health of Harvard University. In addition to courses in applied immunology given in these schools, this laboratory conducts, in conjunction with the Department of Biology of Simmons College, a course of training for college students in bacteriology and serology. Students already graduated have all been placed in desirable positions and the demand for their services shows an appreciation for the training which they receive in this course. In addition to these activities instruction has been given to graduate students, many of whom are sent to Boston by the International Health Board from various countries to be instructed in the preparation and use of serums and vaccines.

8. *Demonstrations.*

The demonstrations of various processes given to medical students, graduate nurses and nurses from various training schools and to students in biology and other sciences have become increasingly popular. During the past year 706 persons have attended these demonstrations.

9. *Lectures and Addresses.*

The Director and the Assistant Director have given lectures on immunity in the Harvard Medical School and have also given addresses before meetings of medical societies, women's clubs and other organizations. These lectures or addresses are on subjects intimately connected with the production and use of biologic products.

10. *Investigations.*

This year the phenomenon of the dissociation of toxin from frozen toxin-antitoxin mixtures has been studied and the results obtained are about to come to publication. This study has been valuable in that it not only throws light on the relations existing between toxin and antitoxin, but has also been of practical use in showing the way to avoid such dissociation. In connection with Professors Zinsser and Felton of the Harvard Medical School, studies on pneumococcus immunity have been carried out and horses have been immunized by methods developed by both Professors Zinsser and Felton.

The experiments in connection with the production of an anti-measles-diplococcus serum have already been mentioned.

A study has been made of various phases of the process employed in concentrating antitoxic serums. The data already obtained have resulted in improvements both in the method and the product.

11. *Publications.*

One paper was published in connection with Dr. Ruth Tunnicliff by Dr. Benjamin White under the title: An Anti-Measles-Diplococcus Serum, Preliminary Communication; Boston Medical and Surgical Journal, Vol. 197, No. 7, pp. 272-273, August 18, 1927.

12. *Inspection.*

Dr. R. E. Dyer of the United States Public Health Service made the usual annual inspection of the laboratory in November, and the license to manufacture and sell biologic products issued by the United States Public Health Service was continued.

II. WASSERMANN LABORATORY. WILLIAM A. HINTON, M.D., *Chief of Laboratory.*

1. Tests and Examinations.

	1923.	1924.	1925.	1926.	1927.
Wassermann Tests	56,214	60,534	62,695	64,665	67,699
Kahn Tests	—	2,554	2,729	1,302	2,644
Gonococcus Fixation Tests	1,542	1,661	1,903	1,776	1,409
Lange's Colloidal Gold Tests	105	88	33	25	35
Complement Fixation Tests for Glanders	—	—	50	27	15
Specimens of Milk Examined for Tuberculosis	—	—	—	—	46
Complement Fixation Tests for Antimentingococcic Serum	—	—	—	79	—
Diagnostic Examinations for the Division of Animal Industry:					
(a) Complement Fixation Tests for Glanders	145	110	42	43	33
(b) Examinations for Rabies	413	283	282	312	510
(c) Pathologic and Bacteriologic Examinations	34	18	24	18	20
(d) Agglutination Tests for Bacillus Abortus	—	148	89	101	282
	58,453	65,396	67,847	68,348	72,693

There has been the usual steady increase in the number of Wassermann tests, and the year shows an increase in the number of Kahn tests done. There was a larger number of examinations for rabies due to the increased prevalence of the disease in this State. There was also a large demand for tests for *Bacillus abortus* infections. In addition to the routine tests and examinations, considerable time was spent in the study of an improved test for syphilis. This is a precipitation test in some ways similar to other precipitation tests having to do with an interaction of a lipid emulsion and specific substances in syphilitic serum. From a large series of observations made in the Massachusetts General Hospital, the Peter Bent Brigham Hospital and the Boston Dispensary, this reaction holds out promise of being a more reliable index of syphilitic infection than either the Wassermann or the Kahn tests. It has the advantage of being very simple in its technic and of being far more economical both in personnel and in materials than the Wassermann test. The method in its essentials is a glycerol-cholesterol precipitation test and is now being further studied. It is quite likely that it will supersede the Wassermann reaction as a routine test for syphilis.

A new activity for the examination of specimens of milk for tuberculosis is listed in the table. This work is a part of Commissioner Bigelow's investigation of milk suspected of being infected with tubercle bacilli and consists in animal inoculations of various samples of milk.

2. Expenses.

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1923	\$11,600.00	\$10,663.15	\$5,600.00	\$5,631.33	\$17,200.00	\$16,294.48
1924	11,800.00	11,689.70	6,000.00	5,827.65	17,800.00	17,517.35
1925	12,500.00	11,984.70	6,000.00	5,971.18	18,500.00	17,955.88
1926	12,600.00	12,186.98	5,500.00	5,386.40	18,100.00	17,573.38
1927	12,616.00	12,506.91	5,300.00	5,068.66	17,916.00	17,575.57

In spite of the increased number of tests and examinations, the expenses were less this year than for the previous year. The larger appropriation for salaries is due to the increases granted as a result of the reclassification study. The higher salaries now paid represent fairer compensation for the nature of the services given and for the type of worker essential for this kind of work. There are still other adjustments upward which should be made in the near future.

3. Publications.

One paper was published by Dr. William A. Hinton under the title: A Glycerol-Cholesterol Precipitation Reaction in Syphilis; Boston Medical and Surgical Journal, Vol. 196, No. 24, pp. 993-996, June 16, 1927.

4. Teaching.

As in previous years this laboratory has been used for teaching purposes, both in the Harvard Medical School and the School of Public Health and it has also received students from Simmons College for training in serology.

REPORT OF DIVISION OF HYGIENE

MERRILL CHAMPION, M.D., *Director*.

In the slow — yet sure — process of education, a year's work is but one step forward along a road which has no ending. Various working methods are tried out. Some are of temporary use, to be discarded later. Others are made part of the permanent activities of the organization. The chief danger in educational work is losing sight of fundamental principles; failing to see the forest because of the trees. This is especially true in the field of hygiene where old ideas are being overturned with great rapidity owing to new discoveries in the field of nutrition, dental hygiene and so forth. Furthermore, we have as yet no adequate measuring rod to test our progress in certain directions, although it is encouraging to note that such measuring rods are in the process of construction.

The division of hygiene keeps before it constantly the following objectives:

To make available to the public the latest information relating to the promotion of hygiene.

To study conditions in the various communities of the state.

To offer communities advice as to bettering conditions.

To demonstrate, wherever possible, to communities ways in which they may put such advice into practice.

The following pages will be a description of the manner in which, during the past year, the division of hygiene carried out this policy.

The activities of the division may be arranged either from the point of view of function or from that of personnel. If from the former, we may speak of (a) maternal and infant hygiene; (b) pre-school hygiene; (c) school hygiene; and (d) the hygiene of the adult. If from the point of view of personnel, we may discuss the activities of physicians, nurses, nutritionists, dental hygienist, health education workers. To avoid repetition, it will be wiser to combine both methods.

HYGIENE OF MOTHERS AND YOUNG CHILDREN.

Here in many respects the greatest potentialities lie. Owing to the difficulty of persuading adults to change their health habits, the hopeful side of adult hygiene is found in the possibility of inducing prospective mothers to accept and put into practice helpful suggestions touching their own health because of the influence on the future health of the unborn child. Again, modern research has confirmed the growing conviction that prenatal life and early childhood furnish our great opportunity to render largely unnecessary the dental, nutritional and mental hygiene difficulties of later life. Lastly, the most significant life-saving opportunities now lie in the field of maternal and early infant mortality.

Since all health promotion for mothers and children seems to rest upon a basis of periodic health examinations, the division during the past year has continued its demonstration well child conferences in different parts of the state. 60 such conferences were held in 58 towns, at which 2,309 children from 1,709 families were examined. This tells only part of the story, however, since all cases needing treatment for defects are referred to family physician and dentist. The family physician receives a statement of the findings of our examining physician. The parents receive advice as to hygiene. The follow-up work is as a rule done by the local visiting nurse who keeps the division informed as to results.

In Franklin County, conferences were held in fourteen towns. It is proposed to visit the towns in this county annually for several years as a demonstration of what can be accomplished by intensive effort through regular examinations and correction of physical defects.

It is to be expected that in some instances, one result of the visit of the division well child conference staff will be the establishment of a permanent conference under local auspices. During the period since 1924 when this work was started, 41 towns have taken this action. But more important than the establishment or non-establishment of such clinics is an increased interest in child health on the part of both family and physician.

Other phases of maternal and infant work will be referred to under the headings of informational letters, printed material, studies, public health nursing, and so forth.

SCHOOL HYGIENE.

The outstanding work of the year in this field has been surveys of school sanitation and school medical and nursing supervision in eleven towns, made at the request of their superintendents of schools and school committees. Reports were rendered which, in some instances, served as the starting point for necessary changes in school plant or medical supervision.

Courses in school nursing procedures and in school health work for teachers were given in co-operation with the department of education at the summer school at Hyannis as in other years. Further co-operation with the above mentioned department included a series of conferences for school nurses (for the fifth consecutive year) and a health service at one of the normal schools.

In addition to these pieces of constructive work there have been the day in and day out conferences with school nurses, school physicians, superintendents, and other town officials on matters as widely varying as the care of pediculosis cases and the proper wording of an article in a town warrant.

PUBLIC HEALTH NURSING.

The division has the services of five nurses, four acting as district consultants to nurses in local communities and one as school nursing consultant. During the latter part of the year we were without the services of a school nurse.

It is rather difficult to list the activities of these nurses. Their duties are many. In the performance of these duties last year one of our nurses travelled over 12,600 miles — the equivalent of half the circumference of the earth. The chief function of these nurses is to keep in constant touch with the public health nurses in the local communities — some eleven hundred in number — advising, encouraging, stimulating and assisting. They assist at the state well child conferences. They give lectures. They teach. They help to "get across" the projects of the rest of the division. They are the generalists in a division of specialists.

NUTRITION.

More and more the work of the nutritionist looms up in importance. A large proportion of the soluble health problems of the future will rest in the hands of the nutritionist and the mental hygienist. Our nutritionists are four in number, three of whom are assigned to the juvenile tuberculosis clinics carried on by the division of tuberculosis. These three participated in the many regular and follow-up clinics carried on last year by the above mentioned division whose report will be found elsewhere. Our Senior Nutritionist was in general charge of the nutrition program and in addition gave brief courses of nutrition lectures to groups of nurses and of teachers, as well as to the general public.

During the summer, visits are paid to various summer camps to advise regarding nutrition and general health habit promotion problems.

DENTAL HYGIENE.

In no phase of hygiene have greater changes in thought come with greater rapidity than in dental hygiene. Massachusetts has not lagged behind and has developed a well-rounded program, the details of which may be obtained from a special publication. Our dental hygiene consultant has spent the year largely in visiting communities carrying on dental work, explaining the state program and getting their participation in it. Communities not yet doing dental work have been assisted to start off right. Unquestionably much money and vexation of spirit will be saved communities concentrating on the state plan.

The division has had invaluable assistance in its work from our dental advisory council in particular, and from the Massachusetts Dental Society and the Massachusetts Dental Hygiene Council in general.

HEALTH EDUCATION.

It might be said with truth that all the work of the division of hygiene may be classed under the head of health education. Certain general activities may, however, be referred to under this heading and others will appear under the heading of special projects.

During the past year, continuing attention has been given to newspaper releases. These, dealing in simple language with problems of hygiene, have gone weekly to a list of 140 newspapers. New health exhibits have been prepared as well as film slides for use in stereopticon lectures. The policy has been continued of visiting supervisors of drawing in the effort, hitherto remarkably successful, to interest them in correlating health teaching with drawing.

Our prenatal and postnatal letter service has been continued. We have been carrying on our prenatal file an average of 868 prospective mothers monthly. On the first year postnatal registry 8,278 letters are sent out monthly, and on the second year postnatal registry 7,088 letters monthly. Requests are received from hospitals, visiting nurse associations, physicians, boards of health, and from mothers themselves.

During the year 2,492,050 pieces of educational material, chiefly brief pamphlets and leaflets, were required.

392 lectures were given by 33 members of the whole department in 116 towns to approximately 27,200 people.

The usual quarterly issues of the department's bulletin, *The Commonhealth*, were brought out.

SPECIAL PROJECTS.

Since child hygiene is a growing thing, new projects are bound to emerge from time to time. The danger is that the new may displace the old simply because of the attractive quality of freshness. None the less we are far from having exhausted the possibilities of novelty which is sound in principle. One of the novelties occupying the attention of the division in 1927 is based on so old and sound a principle of administration as not really to fall within the category of novelties. It is the *Child Health Committee*.

The Child Health Committee, as it is being interpreted by the division of hygiene, is a committee made up of all the community organizations interested directly or indirectly in child health. Both official and unofficial agencies are represented on it. It does not duplicate the work of any existing organization. Its purpose is to co-ordinate existing activities and to stimulate necessary new ones. It serves as a local child health organization to whom the State Department of Public Health may come with problems of state and nation-wide importance, confident that the local application of these problems will meet with study and response. Already many communities are interested. This project will be a continuing one for years to come.

Two other efforts of the year just past must be mentioned. These are Child Health Day and the Summer Round Up.

Child Health Day. — The idea of Child Health Day originated with the American Child Health Association. Carried out on a national basis, it functions through the child hygiene divisions of the state health departments. The underlying purpose is not merely one of "celebration" but much more one of focusing attention in a spectacular way upon the daily need of health habit promotion. It is a day for healthful exercise, preferably in the open air; for giving rewards for health accomplishments; for setting goals for the year to come. Much of the activity centres about the school. A special report elsewhere gives the story of what was done in this state the past year.

Summer Round Up. — With this picturesque title, the National Congress of Parents and Teachers started a nation-wide movement towards getting for every child about to enter school for the first time in the Fall, a careful physical examination and correction of physical defects. For years we have been stressing physical examinations for the pre-school child. The Summer Round Up concentrates attention on one special group of pre-school children and so gives definiteness to the movement. The division gave its utmost co-operation the past year to the

Parent-Teacher Association in furthering the Summer Round Up, correlating it with the activities of the various members of the staff. With Child Health Day, it offers local child health committees concrete objects upon which to expend effort — objects of as much importance next year as this year.

No report concerned with child hygiene could be ended without reference to the maternal and early infant mortality. The rates themselves are to be found in the report of the State Registrar of Vital Statistics who is connected with the Department of the Secretary of State. They offer food for thought. With all our efforts, the maternal and early infant mortality are still too much for us. Nowhere as yet in this country or, indeed, the world, has a satisfactory solution for the puzzle been found. The total infant mortality is falling, doubtless due in part to conscious efforts on the part of child hygiene workers, and also to general improvement in living conditions and sanitation; but also to causes dimly or not at all understood. Prenatal care, better obstetrics, and greater diffusion of health knowledge amongst the public have not as yet had a fair trial. Every division of child hygiene hopes to have a share in bringing this about: it must also bear its share of responsibility for the educational shortcomings of the community.

REPORT OF DIVISION OF TUBERCULOSIS.

SUMNER H. REMICK, M.D., *Director.*

DAVID ZACKS, M.D., *Assistant Director.*

HENRY D. CHADWICK, M.D., *Chief of Clinics.*

After a year's absence Dr. Sumner H. Remick resumed his duties as Director of the Division of Tuberculosis on April 18, 1927. On the same date Dr. Henry D. Chadwick, Acting Director of the Division in the interim, resumed his former duties as Superintendent of the Westfield State Sanatorium and Chief of the Department's Clinics. Dr. David Zacks continued as Assistant Director of the Division. Dr. George M. Sullivan, Supervisor of Tuberculosis Clinics, was transferred, at his request, to the Division of Communicable Diseases in July, 1927. Dr. Sullivan had been in charge of the clinic field work since the beginning of the Ten-Year Program. The success thus far of this important experiment, in a great measure, has been due to his untiring efforts and devotion to the work. The Director accepted his resignation with regret.

In August, 1927, Dr. Frederick H. Gebhardt, Clinic Physician, resigned. This position was filled by the appointment of Dr. Joseph W. Reddy, formerly Assistant Physician at the North Reading and Westfield State Sanatoria.

Dr. William R. Martin has been transferred from the main clinic staff and placed in charge of the re-examination unit.

Dr. David Zacks, pending the appointment of Dr. Sullivan's successor, has temporarily been placed in charge of the clinic field work.

SANATORIA.

The four state sanatoria have provided 353,859 days of treatment for 2,225 patients. The gross weekly per capita cost is as follows: Rutland \$16.89; Westfield \$17.63; North Reading \$16.79; Lakeville \$19.30. For detailed information regarding the Sanatoria the reader is referred to the annual report of the Superintendent of each institution, which will be found in another section.

RUTLAND STATE SANATORIUM.

Rutland has a capacity of 350 beds, and is used exclusively for the hospitalization of adult patients. An average of 225 beds has had to be reserved for patients admitted under contract from the Middlesex, Worcester and Chelsea, Revere and Winthrop Tuberculosis Hospital Districts. Under this arrangement only about 125 beds have been available for early and favorable cases from other sections of the State. As a result of the present contracts, there has been a constant waiting list of from fifty to seventy-five and the Division was unable to hospitalize over 350 patients who applied for treatment during the year.

Dormitories for female employees are greatly needed at Rutland, and have been requested.

WESTFIELD STATE SANATORIUM.

Westfield has a capacity of 300 beds for children between the ages of 3 and 17 years. In last year's report mention was made of the fact that, since the opening of North Reading for children, Westfield had 40 to 50 vacancies, and that adults would temporarily be admitted to relieve the Rutland waiting list. During the past year the number of applications for children has increased, and the adults have nearly all been discharged or transferred so that at present the sanatorium is nearly filled to capacity with children.

The housing for employees remains entirely inadequate and an appropriation has again been requested for a dormitory for nurses and attendants.

NORTH READING STATE SANATORIUM.

North Reading has a capacity of 200 beds and, like Westfield, is used exclusively for the care and treatment of children. Following request of the Department last year, money was appropriated to remodel the Service building. This work has been nearly completed, and provides the institution with excellent bakery and

refrigerating rooms. With the ever increasing waiting list, additions to the present plant must be considered in the near future. It would seem advisable to add a hospital building for the advanced pulmonary cases, also a unit combined with or separate from this building where all cases admitted should be received for a period of observation and classification.

LAKEVILLE STATE SANATORIUM.

Lakeville has a capacity of 200 beds, and is used exclusively for the hospitalization of non-pulmonary tubercular cases for children and adults. Soon after its formal opening in 1926 it was filled to capacity, and the constant waiting list of from 20 to 35 during the past year indicates that the present capacity is inadequate for residents of the Commonwealth needing this special treatment. An extensive building program is being requested in this year's budget.

PONDVILLE HOSPITAL.

This Institution of 90 beds for the treatment of cancer was formally opened on June 21, 1927. As all the other institutions in the Department of Public Health come under the administration of the Division of Tuberculosis, it seemed advisable, especially for administrative purposes, to add this hospital to the Division. The report of the Superintendent and of other members of the Department on various phases of the cancer program will be found in another section of the Department's annual report.

TUBERCULOSIS DISPENSARIES.

The law provides that all cities of 50,000 population or over shall maintain a dispensary, that towns and cities under 50,000 may, and shall at the request of the Department of Public Health. During the past year, Dr. Zacks has visited every dispensary one or more times, and has made a careful study of their work. A detailed report of his observations has been submitted to the Commissioner of Public Health, and it is expected that during the coming year an aggressive and comprehensive campaign may be inaugurated to encourage and stimulate local effort. The local tuberculosis dispensary, through its physician and nurses, ought to be the most important agency in the State for the diagnosis and supervision of tuberculosis.

RECORDS OF REPORTED CASES.

There are approximately 30,000 reported cases in our records. A new code system and statistical machine have been installed to facilitate the handling of these records. This system has proved its efficiency, but owing to the enormous amount of work entailed in changing over the system of records, files, etc., the year's "check-up" is not completed, but there should be no difficulty in this respect the coming year.

During the past year the follow-up work carried out by nurses has been done more efficiently than before and with five nurses instead of seven. In the coming year, I believe, the work may be better systematized so that four nurses instead of five will be needed.

THE TEN-YEAR PROGRAM.

The clinic group of sixteen members has been maintained during the third year. This unit has given the first examination to 19,527 school children and re-examined 2,636 children who were found during the previous two years to be tuberculous or suspected cases of tuberculosis.

All the cities, except Medford, Taunton, Quincy and Somerville and part of Fall River, have had the examinations. If we continued on the same basis of examining only the underweight and contact children, the State would be covered at the end of the fourth year. It has, however, been decided to change the plan and examine all the children where the parents request it. This will mean an examination of approximately 60% of the children instead of 15%, and on this basis it will take two or three years more, or five or six years altogether, to cover all the cities and towns in the State.

This change in procedure was decided upon, as our statistics show that many of the pulmonary and hilum cases found during the first three years were found in

children of average weight or over-average. The group of contact children shows a much higher percentage of infection and disease. There was no noticeable increase in the percentage of disease in the underweight children, except in girls 15% or more underweight.

During the past year, clinics have been held in the following cities and towns: Ipswich, Winthrop, East Bridgewater, Lynn, Nahant, Groton, Townsend, Ayer, Shirley, Lenox, Stockbridge, Great Barrington, Egremont, Monterey, New Marlboro, Sheffield, Yarmouth, Falmouth, Norwell, Hanover, Chelmsford, Whitman, Waltham, Everett, Framingham, Holliston, Wakefield, Abington, Medway, Brookline, Groveland, Merrimac, Cambridge, Melrose, Boston, Chelsea, Worcester, Marlboro, Hudson, Stow, Millbury, Clinton, Harvard, North Brookfield, Brookfield, New Braintree, West Brookfield, Warren, Spencer, Oxford, Haverhill, Berkley, Freetown, Dighton, Carver, Middleboro, Wareham, Seekonk, Rehoboth, Belmont, Barnstable, Dennis, Chatham, Orleans, Eastham, Brewster, Wellfleet, Truro, Provincetown, Mashpee, Vineyard Haven, Stoneham, Dracut, Concord, Watertown, Hanson, Gloucester, Rockport, Manchester, Maynard and Southwick.

SUMMARY OF RESULT OF THE THIRD YEAR'S EXAMINATION.

	Total
Number of children examined	19,527
Number of contacts examined	2,367
Number given Von Pirquet test	19,194
Number of children with positive Von Pirquet (reactors)	5,188
Number of children X-rayed	6,736
Number of cases diagnosed as pulmonary tuberculosis	29
Number of cases diagnosed as hilum tuberculosis	524
Number of cases classified as suspects	1,113
Number of cases X-rayed and classified as negative	4,135
Number of children with enlarged or diseased tonsils and adenoids	3,682
Number of children with defective teeth	9,863
Number of children with heart murmurs	351
Number of cases of malnutrition	2,432

The total expenditure for the clinic service for the past year amounted to \$51,198.07. The total number of examinations was 22,163. The cost per child for each examination would thus amount to \$2.31. This is very reasonable when we consider the type of service given.

COUNTY TUBERCULOSIS HOSPITALS.

As pointed out previously, Middlesex and Worcester Counties, under authority of Chapter 500 of the Acts of 1924, have made short term contracts with the Department for the care of their patients at the Rutland State Sanatorium. Owing to the increasing number on the Rutland waiting list and the large number of patients refused treatment during the year, the Department declined to renew the contracts which expire in May and June of next year. The County Commissioners were immediately notified of this action, and requested to comply with the County Tuberculosis Hospital Act passed in 1916.

The Essex County Tuberculosis Sanatorium has added 40 beds during the year.

The Norfolk County Tuberculosis Hospital is contemplating adding 30 beds during the coming year. With this addition the hospital should be adequate for the district served.

The Hampshire County Tuberculosis Hospital is entirely inadequate for the district served, and prompt steps should be taken to increase its bed capacity.

The remaining county tuberculosis hospitals appear to be adequate for the present.

SUBSIDY.

Chapter 111 of the General Laws, Section 76-77, provides that under certain conditions cities and towns providing hospital care for cases of pulmonary tuberculosis in hospitals approved by this Department are to be reimbursed by the Commonwealth at the rate of \$5 per week per patient. For the year ending November 30, 1927, there have been received 2,561 claims for subsidy from 101 cities and towns. Of this number 2,088 claims, amounting to \$230,535.55, were allowed.

LAKEVILLE STATE SANATORIUM.

RESIDENT OFFICERS.

LEON A. ALLEY, M.D., *Superintendent.*
 HAROLD RAGOLSKY, M.D., *Assistant Superintendent.*
 VALMORE A. PELLETIER, M.D., *Assistant Physician.*
 CHIN S. CHANG, M.D., *Junior Bacteriologist.*
 CAROLINE T. WHITE, R.N., *Superintendent of Nurses.*
 KATHARINE NUTE, *Head Occupational Therapist.*
 FLORENCE S. MONROE, *Senior Bookkeeper and Treasurer.*
 SUSAN M. MURPHY, *Head Housekeeper.*
 CHESTER TAYLOR, *Steward.*
 ROBERT A. KENNEDY, *Chief Engineer.*
 THOMAS FRANCIS MAHONY, *Head Farmer.*

NON-RESIDENT OFFICERS.

ZABDIEL B. ADAMS, M.D., *Orthopedic Consultant.*
 JOHN B. LOMBARD, D.M.D., *Dentist.*

REPORT OF THE SUPERINTENDENT.

TO GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the eighteenth annual report of the Lakeville State Sanatorium for the year ending November 30, 1927. During the year there has been expended \$188,453.00 for maintenance, a gross weekly per capita cost of \$19.30. There has been collected from miscellaneous sources, (the total of all collections) \$78,783.39. Deducting this amount from the gross maintenance expense leaves a net expense of \$109,669.61 and a net weekly per capita cost of \$11.23. There has been collected from private sources \$9,090.14, from Cities and Towns \$65,442.64, from the State Board of Retirement \$19.98, and from Sales \$4,230.63. There were 43 patients supported wholly or in part by private funds, 192 by Cities and Towns, 66 wholly by the State, and there are 23 patients on whom settlement has not been determined, there were 2 State Wards.

There has been expended from special appropriation, authorized by chapter 211, Acts 1925 (\$6,500 for Administration Building) expended during 1926, \$6,482.66, reverting to State Treasury \$17.34. This building has been completed. Authorized by chapter 277, Acts 1925, 1926, 1927 (\$47,438.92 for New Water System) expended prior to 1927, \$33,941.71, during 1927, \$10,679.21. Total \$44,620.92. This work has been completed. As authorized by chapter 211, Acts 1925 (\$28,000 for alterations on Children's Building) expended during 1925 and 1926 \$27,529.78. Reverting to State Treasury \$470.22. This work has been completed. As authorized by chapter 211, Acts 1925, (\$33,000 for alterations on Women's Building) expended during 1925 and 1926, \$32,917.23, reverting to State Treasury \$82.77. This work has been completed. As authorized by chapter 79, Acts 1926 (\$40,000 for reconditioning Men's Building) expended prior to 1927 \$38,679.83, in 1927 \$818.01, total \$39,497.84. This work has been completed. As authorized by chapter 138, Acts 1927 (\$25,000.00 for Surgical Building) expended during 1927 \$15,292.29. This building has not been completed. As authorized by chapter 138, Acts 1927, (\$30,000.00 for Sewage Disposal) expended during 1927 \$669.29. This work has not been completed.

There were 171 patients in the Sanatorium at the beginning of the year, December 1, 1926, and 194 at the close, November 30, 1927. The largest number present at one time was 201, and the smallest 170. The daily average number of patients was 187.73, 61.07 more than last year. Daily average number of bed patients was 163.98, children 103.87, adults 60.11. There were 157 patients admitted during the year. For the classification of patients admitted, your attention is called to "Table No. 7." The average age of patients admitted was 22 years. Including deaths there were 134 patients discharged, and the average duration of residence was 272 days. Of those discharged 87 gained 118,300 pounds, an average gain of 13.60 pounds per person. Of those discharged there were 22 arrested, 18 apparently arrested, 26 quiescent, 33 improved, 5 unimproved, 16 deaths, 7 not considered,

the duration of treatment being less than one month, 5 non-tuberculous, 2 inactive. There were 68,522 hospital days of treatment, 22,293 hospital days more than for 1926.

APPOINTMENTS AND RESIGNATIONS.

Dr. Myles S. Record, who was appointed Assistant Physician on November 30, 1926, resigned June 11, 1927, to enter general practice in Abington, Mass.

Dr. Jacob Chayet, a graduate of Tufts College Medical School, followed by an internship at the Boston City Hospital, was appointed Assistant Physician Feb. 7, 1927. He resigned Oct. 31, 1927, to return to the Boston City Hospital to take up special research work.

Dr. Valmore A. Pelletier, a graduate of Harvard Medical School 1926, followed by an internship at the Brockton Hospital, was appointed Assistant Physician Aug. 22, 1927.

The vacancy created by the resignation of Dr. Chayet has not as yet been filled.

Mr. Charles J. Odenweller was transferred to Pondville State Hospital at Norfolk April 30, 1927. Mr. Chester Taylor of the Rutland State Sanatorium was appointed Steward June 5, 1927.

MEDICAL REPORT.

The routine work on medical records has been continued during the past year. Studies are being made on the human and bovine tubercle bacilli. Cystoscopic examinations have been added to our routine in cases of Genito-urinary tuberculosis. There have been 18 cystoscopic studies made during the past year. Our object is: (1) The study of the bladder for tuberculous ulcerations; (2) Ureteral catheterization for guinea pig inoculation; (3) Pyelography, as a means of differential diagnosis. A basal metabolism apparatus has been added to our equipment for the study of the relationship between metabolism and heliotherapy.

Heliotherapy along with absolute general rest plus necessary orthopedic management for local rest has been carried out during the past year with most encouraging results.

Inasmuch as the sun is available for purposes of heliotherapy at all seasons, the ultra violet lamps have been used as an adjuvant, and then in selected cases. We feel, however, that at best artificial sunlight is a poor substitute for the natural actinic rays. In certain cases of lupus vulgaris, and in cases of tuberculous cystitis, the lamps have been of some value. The Thezac-Porsmeur lens, by means of which the sun's rays are concentrated, is used in superficial tuberculous ulcerations. Its value in this type of case is at times striking. There were 206 days of sunshine during the year, 12 days less than during the fiscal year 1926.

Staff meetings have been held every Monday morning and a staff visit is made each Friday morning as during the previous year.

The immunization policy, which includes vaccination, the Schick test and administration of toxin-antitoxin for diphtheria has been continued among employees and patients. In addition to the above, employees are given typhoid and para-typhoid vaccine and all food handlers are Widal tested, and examined for the detection of possible typhoid carriers.

Even with the above protective measures we have again had an outbreak of contagious diseases in our Children's Building. There were two cases of pertussis in January, 1927, which undoubtedly followed the larger number of cases earlier in the winter of 1926 and 1927. In February and March, there were 16 cases of chicken pox in the same ward. Fortunately all of the above cases were of the mild type and the epidemic was limited to one building. This however, again brings up the question of an isolation unit, which was of necessity put over last year to some future time.

Several cases required surgical treatment during the past year. Tonsils and adenoids were removed in 22 cases. There were 3 amputations of the lower extremity, 2 below the knee for tuberculosis of the ankle and 1 above the knee for the removal of a tuberculous knee where the processes had hopelessly involved and destroyed the joints. There were 14 patients temporarily transferred to other hospitals for fusion operations of either the spine, hip or knee. With the completion of the new surgical building, the transferring of patients to other hospitals will no longer be necessary. This should result in much time being saved by the

patient as well as avoiding the loss of hospital days to the sanatorium, as we were obliged to hold the beds for these patients while they were away. There were 222 hospital days lost last year due to this condition.

It is interesting to note that there were three cases discharged during the year with the diagnosis of malignant disease. Two of these cases were admitted with the diagnosis of tuberculous peritonitis with effusion, the third had a tuberculous spine plus adeno-carcinoma of the left breast and axilla. One of the abdominal cases was proven to be primary liver cell carcinoma at autopsy, 15 weeks after his admission. The other was proven to be ovarian malignancy upon exploratory laparotomy. Both of the abdominal cases had wine colored fluid aspirated from the abdomen on several occasions, and guinea pig inoculations were persistently negative for tuberculosis. I believe these cases again emphasize the difficulty in making an early diagnosis of either tuberculosis or malignant disease, without adequate laboratory facilities and sufficient time for proper study.

Patients were examined for subsidy at the Barnstable County Hospital, Pocasset; Bristol County Hospital, Attleboro; Fall River Tuberculosis Hospital, Fall River; Plymouth County Hospital, South Hanson; and Sassaquin Sanatorium, New Bedford. A total of 127 patients were examined at these Sanatoria. There were 68 patients examined at the institution.

	Positive.	Negative.	Totals.
Barnstable County Hospital, Pocasset	2	2	4
Bristol County Hospital, Attleboro	9	4	13
Fall River Tuberculosis Hospital, Fall River	31	16	47
Plymouth County Hospital, South Hanson	16	3	19
Sassaquin Sanatorium, New Bedford	36	8	44
	<hr/> 94	<hr/> 33	<hr/> 127

Patients examined at the sanatorium:

	Negative.	Suspicious.	Positive.	Re-exam.	Totals.
Out-patients	13	4	14	8	39
Employees	29	—	—	—	29
	<hr/> 42	<hr/> 4	<hr/> 14	<hr/> 8	<hr/> 68

Total examinations 195.

LABORATORY, X-RAY AND PHOTOGRAPHIC REPORT.

The usual routine work, that is examination of sputum, pus, urine, spinal fluid, feces, urethral discharge, blood, serological test and animal experiment, has been carried on during the past year.

	Number.	Total.
Number of animals inoculated during the year	—	349
Number of specimens examined during the year	—	2,907

An analysis of these 2,907 specimens discloses the following:

Clinical Microscopy

Sputum	Positive T.B.	18	—
	Negative T.B.	48	66
Urine	1,034	—	—
	Positive T.B.	7	1,041
Feces	—	—	21
Spinal fluid	Positive T.B.	2	—
	Negative T.B.	5	7
Urethral discharge,	Negative G.C.	—	11
Routine examination of blood	—	—	638

Serological Tests

Tubercumet tests	Positive	79	—
	Negative	49	—
	Doubtful	3	131
Tuberculin tests	Positive	—	176
Phthalin tests	—	—	100
Guaiac tests	Negative	—	1

P.D. 34.			131
Wassermann tests	Positive	10	—
	Negative	122	—
	Doubtful	3	135
Kahn tests	Positive	3	—
	Negative	8	11
Microscopic agglutination (on Widal)	Negative	—	107
Colloidal Gold tests	Negative	—	2
<i>Animal Experiment</i>			
Guinea pig autopsy	Positive T.B.	114	—
	Negative T.B.	135	249
<i>Bacteriological Examination</i>			
Throat Culture	Positive K.L.	2 (in employees)	
	Negative K.L.	12	14
Dental smear, Vincent's angina	Positive	33	—
	Negative	164	197
<i>Preparation of Media for T.B.</i>			
Glycerine Bouillon			
Petroff's Medium			

X-Rays

Number of X-rays taken from December 1, 1926, to November 30, 1927 491

Photographs.

Number of photographs taken from December 1, 1926, to November 30, 1927 212

There have been 491 roentgenograms taken during the past fiscal year. These include chest, bone and joint, and gastro-intestinal plates. Pyelograms have been a means of differential diagnosis in several instances, where tuberculous nephritis has been diagnosed in cases of hydronephrosis.

The question of pulmonary disease associated with the extra-pulmonary lesion is being studied. A combination X-ray table and Bucky diaphragm, the latter for orthopedic work, now being installed in our new X-ray laboratory, will afford a more efficient means to take chest films in these cases. Heretofore, these were taken under difficulties, owing to the presence of orthopedic appliances about the chest. A statistical report is being compiled to show the ratio of the cases of pulmonary disease in our group of extra-pulmonary patients.

There have been 212 photographs recorded during the past fiscal year. These are taken of all patients upon admission, as well as upon discharge. The most striking contrasts are made into a series of lantern slides, which are shown upon various occasions.

DENTAL REPORT.

December 1, 1926, to November 30, 1927.

Examinations	122	Plates	2
Re-examinations	169	Repair plates	4
Mouth smears	197	Repair bridges	2
Mouth washes	48	Re-cemented crowns and bridges	5
Fillings	52	Gold crowns	4
Temporary fillings	68	Abscesses	3
Treatments	76	Pyorrhea cases	1
Extractions	120	Vincent's angina cases	33

With the moving of the dental office to the new Surgical Building, it will be possible for many more patients to be brought to the office on stretchers, so that more satisfactory work can be accomplished than has hitherto been possible with the patients in bed and the inaccessibility of the former dental office.

OCCUPATIONAL THERAPY.

The department of occupational therapy has made rapid strides during the past year. In April, 1927, a volunteer assistant to our Head Occupational Therapist came to the sanatorium and has been most helpful in establishing a shop for the department in the basement of the Men's Building. The affiliation with the Boston School of Occupational Therapy, whereby two student workers come to

this sanatorium each month for training, has demonstrated its value in many respects. Better results have been noted with this added personnel as the patients now receive much more individual instruction.

The kinds of crafts and the numbers of finished products in each craft are as follows:

Basketry: Trays	150	Hand loom weaving:	
Baskets	275	Table runners	2
Cradle bases	7	Bags	2
Leather: Purses	50	Scarves	1
Match cases	12	Card Weaving: Belts	6
Cigarette cases	12	Dress trims	10
Leather corners	20	Bags: Beaded	4
Writing cases	3	Net weave	6
Knotting: Belts	30	Felt	4
Whistle lanyards	20	Knitting: Sweaters	7
Dog leashes	12	Rug strips	50
Napkin rings	3	Crocheting: Infants' wear	12
Rake knitting:		Raffia book cov-	
Scarves	15	ers	3
Caps	25	Wooden toys	12
Baby blankets	3	Scrap books	50
Total			806

The largest number of patients working at one time during the year was 150.

The smallest number was 86, which occurred at the time the Children's Ward was isolated because of chicken pox.

FARM.

The farm has had another successful year. While the yield of fruit was considerably less than the previous year, the return of vegetables, milk and eggs was very satisfactory. A small surplus of vegetables and eggs was sold to the new Pondville Hospital for Cancer. On Oct. 20, 1927, the herd of 56 head was again accredited.

IMPROVEMENTS.

The reconstruction of the Men's Building was completed early in the year and for several months has been filled to capacity.

The new pumping station at Clear Pond was finished last spring.

Both water tanks have been repaired and repainted.

The new Surgical Building is practically finished and should be available for use in January, 1928. Grading about this building and the reclaiming of the land to the north, of both the Surgical and Children's Building has been done this Fall.

A wagon shed has been constructed near the stable; this has made it possible to get all farm machinery under cover.

FIRE PROTECTION.

Monthly drills and inspections have been held throughout the year.

Automatic sprinklers have been installed in the center basements of the Men's and Children's Buildings. Sprinklers were installed in the Surgical Building during construction. Two hydrants have been installed at the Dairy Plant. The Dairy Barn has been rewired throughout with BX cable metal switch and fuse boxes installed in place of the wooden ones.

RECOMMENDATIONS.

Recommendations are submitted:

1. That the South Pavilion be remodeled and equipped for a 30 bed unit for men. The general changes and type of construction to be similar to those completed during the past year on the Men's Building.

2. That a Nurses' Home be constructed and equipped to provide necessary and suitable quarters for the nurses and attendants, now housed in rooms located in various buildings about the institution. Also to provide rooms for additional nurses necessary to care for the increase in patient population during the next one or two years.

3. That a new Children's Building be constructed and equipped for girls in order to release beds in the Women's Building for women which are now occupied by girls from 8 to 18 years of age. An isolation unit should be included in this building.

4. That additions be made to the Power Plant to provide for new boilers, stack and engine, as the present capacity of the Plant is insufficient to meet the needs of this institution with the above mentioned recommendations.

5. That additional money be appropriated for the construction of filter beds, as the present sewage disposal system is inadequate to meet the present demands of the institution.

6. That additional fire protection be provided as follows:

1. Automatic sprinklers in the basement of the Male Employees' Building.

2. In the basement and attic of the Administration Building.

3. In the basement of the Women's Building.

4. A hydrant located south of the Administration and Women's Buildings.

7. That the steam main from the Men's Building through the Administration Building to the Women's Building be replaced by a larger main sufficient to provide exhaust steam for the heating of water, steam tables, and buildings west of the Men's Building. Steam for new buildings would be available from this main.

8. That provisions be made for a more satisfactory handling of the laundry as the present Laundry Building and equipment are inadequate to meet the daily needs of the institution.

9. That money be appropriated to clean up the water shed about Clear Pond and grade about the well field and pump house. A forest fire in that vicinity would burn the fence and power line posts and cause damage that can be prevented by the removal of brush, et cetera, which can now be trimmed with scythes along the fence and pole lines.

ENTERTAINMENTS.

A portable moving picture machine and a curtain were purchased and moving pictures have been provided on the Wards for the benefit of the bed patients during the past Fall. This has aided considerably in relieving the need of entertainment other than that provided by the radio.

ACKNOWLEDGMENTS.

No religious services have been held in the hall during the past year. The clergymen of the Catholic, Protestant and Hebrew denominations have visited on the wards and have done the best they could to care for the needs of our patients. As the majority of our patients can not leave their beds it has been impossible to get groups together of more than two or three people at one time, therefore a large part of the religious instruction has of necessity been individual.

To the many thoughtful and generous friends of the patients and institution I gratefully acknowledge the many gifts of toys, books, magazines, candy and entertainments for the children and adults.

It is most gratifying to note the few changes among the heads of departments, supervisors, and other personnel during the past year, and it is to these loyal and co-operative employees that I express my deep appreciation and acknowledge their efficient services for your approval.

I am grateful for your interest, advice, and consideration, in meeting the problems of the past year.

Respectfully submitted,
LEON A. ALLEY, M.D.,
Superintendent.

VALUATION.

Land.

Grounds, 50 acres	\$7,155 30
Lawns and buildings, 48 acres	535 70
Roads, 2 acres	
Woodland, 10 acres	1,730 37
Mowing, 34 acres	4,311.81
Tillage, 49 acres	
Tillage, 30 acres	
Garden, 19 acres	
Orchard, 8 acres	611 65
Pasture, 41 acres	1,816 41
Waste and miscellaneous, 17 acres	942 27
Meadow, pasture and swamp land, 16 acres	
Coal trestle, 1 acre	
	<hr/>
	\$17,103 51
Sewerage System	4,882 00
	<hr/>
	\$21,985 51

Buildings.

Institution Buildings	\$319,700 00
Farm, Stable and Grounds	54,947 26
Miscellaneous	134,182 69
	<hr/>
	\$530,815 46
Personal value of all personal property as per inventory of Nov. 30, 1927	14,813 36
	<hr/>
Grand Total	\$545,628 82

POPULATION.

	Males.	Females.	Boys.	Girls.	Totals.
Number received during the year	40	33	50	34	157
Number passing out of the Institution during the year	40	28	28	38	134
Number at end of the fiscal year in the Institution	33	40	74	47	194
Daily average attendance (number of inmates actually present during year)	32	37	67	51	187
Average number of employees and officers during the year	87.5	46.695	-	-	134.195

EXPENDITURES.

Current Expenditures:					
Salaries and Wages			\$112,610	34	
Clothing				663	38
Subsistence				22,355	60
Ordinary				4,362	37
Office, Domestic, Outdoor Expenses				48,461	31
					<hr/>
					\$188,453 00
Extraordinary Expenses:					
Permanent Improvements:					
New Water System (Chapter 277, Acts 1925-26-27)			\$10,679	21	
Alterations on Children's Building (Chapter 211, Acts 1925)				375	00
Reconditioning Men's Building (Chapter 79, Acts 1926)				818	01
Surgical Building (Chapter 138, Acts 1927)				15,292	29
Sewerage Disposal (Chapter 138, Acts 1927)				669	29
					<hr/>
					27,833 80
Grand Total					<hr/>
					\$216,286 80

Summary of Current Expenses.

Total Expenditures	\$216,286 80
Extraordinary Expenses Deducted	27,833 80
	<hr/>
Deducting amount of sales	4,230 63
	<hr/>
	\$184,222 37

Dividing this amount by the daily number of patients, 187.7314, gives a cost for the year of \$981.3082, equivalent to an average weekly net cost of \$18.8713.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Boys.	Girls.	
Patients in the Sanatorium Nov. 30, 1926	31	33	54	53	171
Patients admitted Dec. 1, 1926, to Nov. 30, 1927	40	33	50	34	157
Patients discharged Dec. 1, 1926, to Nov. 30, 1927	40	28	28	38	134
Patients remaining in Sanatorium Nov. 30, 1927	33	40	74	47	194
Daily average number of patients	32.3178	37.4082	66.8164	51.1890	187.7314
Deaths (included in number discharged)	5	4	4	3	16

TABLE 2. — *Civil Condition of Patients Admitted.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Boys.	Girls.	
Single	20	11	50	34	115
Married	18	16	—	—	34
Widowed	2	4	—	—	6
Divorced	—	2	—	—	2
	40	33	50	34	157

TABLE 3. — *Age of Patients Admitted.*

	ADULTS.		CHILDREN.		Totals.	Percentage.
	Males.	Females.	Boys.	Girls.		
1 to 13 years	—	—	28	22	50	31.85
13 to 17 years	—	—	8	8	16	10.19
17 to 20 years	—	—	8	4	12	7.64
20 to 30 years	20	9	6	—	35	22.29
30 to 40 years	9	11	—	—	20	12.74
40 to 50 years	8	6	—	—	14	8.92
Over 50 years	3	7	—	—	10	6.37
	40	33	50	34	157	—

TABLE 4. — *Nativity and Parentage of Patients Admitted.*

	ADULTS.						CHILDREN.						TOTALS.		
	MALES.			FEMALES.			BOYS.			GIRLS.					
	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.
United States:															
Massachusetts	11	4	1	11	4	3	37	11	12	26	11	10	85	30	26
Other New England States	1	1	1	2	-	1	3	1	3	3	2	4	9	4	9
Other States	3	2	4	-	2	3	4	5	7	2	6	4	9	15	18
	15	7	6	13	6	7	44	17	22	31	19	18	103	49	53
Other Countries:															
Albania	1	1	1	-	-	-	-	-	-	-	-	-	1	1	1
Armenia	2	2	2	-	-	-	-	1	1	-	-	-	2	3	3
Austria	1	1	1	-	-	-	-	-	-	-	-	-	1	1	1
Canada	10	9	11	5	4	5	4	8	6	-	3	4	19	24	26
England	1	3	1	1	3	2	-	-	-	-	-	2	2	6	5
Holland	-	-	-	1	1	1	-	-	-	-	-	-	1	1	1
Germany	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Greece	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Ireland	1	4	4	4	8	8	-	2	2	-	1	1	5	15	15
Italy	5	5	4	1	2	1	1	4	4	-	3	2	7	14	11
Lithuania	-	-	-	1	1	1	-	-	-	-	1	1	1	2	2
Poland	1	1	1	1	1	1	-	4	4	-	2	2	2	8	8
Portugal	-	-	-	-	1	1	1	5	3	-	-	-	1	6	4
Roumania.	-	-	-	-	-	-	-	1	1	-	-	-	-	1	1
Russia	1	3	3	4	4	4	-	2	2	2	2	2	7	11	11
Scotland	-	-	-	1	1	1	-	-	-	-	-	-	1	1	1
South America.	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
Sweden	2	3	3	1	1	1	-	1	-	-	-	-	3	5	4
Syria	-	-	-	-	-	-	-	1	1	-	-	-	-	1	1
Unknown	-	-	3	-	-	-	-	3	4	1	2	2	1	5	9
	40	40	40	33	33	33	50	50	50	34	34	34	157	157	157

TABLE 5. — *Residence of Patients Admitted.*

	Adults.		Children.		Totals.
Attleboro	—	—	—	—	1
Bellingham	—	—	1	—	1
Boston	30	—	20	—	50
Braintree	—	—	1	—	1
Brockton	1	—	1	—	2
Brookline	1	—	—	—	1
Cambridge	10	—	3	—	13
Chelsea	2	—	1	—	3
Clinton	1	—	—	—	1
Dedham	—	—	1	—	1
Duxbury	—	—	1	—	1
Basthampton	—	—	2	—	2

TABLE 5. — *Residence of Patients Admitted.*—Concluded.

	Adults.	Children.	Total.
Everett	—	1	1
Fall River	—	4	4
Fitchburg	—	1	1
Framingham	—	1	1
Franklin	—	1	1
Gloucester	1	1	2
Greenfield	1	—	1
Haverhill	1	1	2
Indian Orchard	—	1	1
Lawrence	1	2	3
Leverett	—	1	1
Lowell	—	6	6
Lynn	5	2	7
Malden	3	1	4
Manchester	—	1	1
Mansfield	—	1	1
Mattapoisett	—	1	1
Medford	2	—	2
Melrose	—	1	1
Methuen	—	2	2
Nahant	1	—	1
Needham	—	1	1
Newburyport	—	2	2
Newton Centre	—	1	1
Newton Highlands	1	—	1
Norwood	—	1	1
Pittsfield	—	2	2
Providence, R. I.	—	1	1
Quincy	—	1	1
Reading	1	1	2
Salem	2	—	2
Somerville	2	1	3
Springfield	1	2	3
Sturbridge	—	1	1
Sutton	1	—	1
Taunton	—	1	1
Waltham	—	1	1
Waverley	—	1	1
West Newton	—	1	1
Westport	—	1	1
Weymouth	—	1	1
Whitinsville	1	—	1
Worcester	3	4	7
Totals	73	84	157

TABLE 6. — *Occupations.*

	Males.	Females.	Boys.	Girls.	Totals.
Attendant	—	1	—	—	1
Baker	2	—	—	—	2
Bookkeeper	2	—	—	—	2
Carpenter	1	—	—	—	1
Cashier	—	1	—	—	1
Chambermaid	—	1	—	—	1
Child	—	—	18	8	26
Clerk, office	2	—	—	—	2
Clothing Inspector	1	—	—	1	1
Cook	1	—	—	—	1
Florist	—	3	—	—	3
Home	—	2	—	—	2
Housekeeper	—	14	—	—	14
Housewife	—	—	—	1	1
Housemaid	—	2	—	—	2
Housework	1	—	—	—	1
Janitor	8	—	3	—	11
Laborer	2	—	—	—	2
Machinist	1	—	—	—	1
Milkman	—	—	1	—	1
Mill (Cotton) Packer	—	1	—	—	1
Mill (Cotton) Weaver	—	—	1	—	1
Mill (Cotton) Weigher	—	—	—	1	1
Mill (Knitting) Stitcher	—	1	—	—	1
Newspaper Editor	1	—	—	—	1
Newspaper Pressfeeder	—	1	—	—	1
Packer — Fish Factory	—	—	1	—	1
Painter	3	—	—	—	3
Pharmacist	1	—	—	—	1
Photographer	1	—	—	—	1
Printer	2	—	—	—	2
Radio Dial Maker	—	—	1	—	1
Salesman, auto	1	—	—	—	1
Salesman, marble	1	—	—	—	1
School	—	—	21	24	45
School Teacher	—	1	—	—	1
Seamstress	—	1	—	—	1
Shoelace Maker	—	—	1	—	1

TABLE 6. — *Occupations. — Concluded.*

	Males.	Females.	Boys.	Girls.	Totals.
Shoe Shop	—	1	—	—	1
Shoe Shop Laster	1	—	1	—	2
Shoe Shop Packer	—	1	—	—	1
Shoe Shop Shipper	—	—	1	—	1
Shoe Shop Turner	1	—	—	—	1
Silver Dipper	1	—	—	—	1
Soap Maker	1	—	—	—	1
Stenographer	—	1	—	—	1
Stove Foundry Nickel Plater	1	—	—	—	1
Superintendent of Building	1	—	—	—	1
Tailor	1	—	—	—	1
Teamster	1	—	—	—	1
Truck Driver	1	—	1	—	2
Waitress	—	1	—	—	1
	40	33	50	34	157

Total number of Occupations 52, total number of Patients 157.

TABLE 7. — *Stage of Disease on Admission.*

<i>One Lesion.</i>	Males.	Females.	Boys.	Girls.	Totals.	Per-centage.
Tb. Adenitis, Cervical	1	1	2	1	5	3.18
Tb. Adenitis, Inguinal	1	—	—	—	1	.636
Tb. Ankle	1	1	1	—	3	1.91
Tb. Coecum	—	—	1	—	1	.636
Tb. Colon	—	1	—	—	1	.636
Tb. Dactylitis	—	—	1	—	1	.636
Tb. Elbow	—	2	—	—	2	1.28
Tb. Eye	—	—	1	—	1	.636
Tb. Foot	—	1	1	—	2	1.28
Tb. Hip	6	5	9	9	29	18.48
Tb. Ileo-cecal	—	—	—	1	1	.636
Tb. Ileo-colic	—	—	1	—	1	.636
Tb. Kidney	2	1	3	—	6	3.82
Tb. Knee	3	1	1	6	11	7.
Tb. Mastoid Bone	—	—	1	—	1	.636
Tb. Left Psoas Muscle	1	—	—	—	1	.636
Tb. Nephritis	—	1	—	—	1	.636
Tb. Peritonitis	2	—	4	—	6	3.82
Tb. Peritonitis with Effusion	—	1	1	—	2	1.28
Tb. Sacro-iliac	2	—	—	1	3	1.91
Tb. Shoulder	—	—	1	—	1	.636
Tb. Spine	10	9	11	6	36	22.93
Tb. Skin	2	2	2	2	8	5.10
Tb. Wrist	—	—	1	—	1	.636
Renal Tuberculosis	—	1	—	—	1	.636
	31	27	42	26	126	—
<i>Two Lesions.</i>						
Tb. Adenitis, Cervical, Tb. Peritonitis, Nodular	—	—	—	1	1	.636
Tb. Ankle, Pulmonary Tuberculosis	1	—	—	—	1	.636
Tb. Colitis with Fecal Fistula	—	1	—	—	1	.636
Tb. Dactylitis both hands and feet	—	—	—	1	1	.636
Tb. Hip, Hilum Tb.	—	—	—	1	1	.636
Tb. Hip, Tb. Wrist	1	—	—	—	1	.636
Tb. Kidney, Tb. Cystitis	—	1	—	—	1	.636
Tb. Knee, Tb. Hip	1	—	—	—	1	.636
Tb. Knee, Pulmonary Tb.	1	—	—	—	1	.636
Tb. Pharynx, Tb. Skin	—	—	1	—	1	.636
Tb. Skin, Osteomyelitis	1	—	—	—	1	.636
Tb. Spine, Tb. Ankle	—	—	1	—	1	.636
Tb. Spine, Tb. Knee	—	1	1	—	2	1.28
Tb. Spine, Pulmonary Tb.	—	1	—	1	2	1.28
Tb. Wrist, Tb. Knee	—	—	1	—	1	.636
Pulmonary Tb., Tb. Lip	1	—	—	—	1	.636
	6	4	4	4	18	—
<i>Three Lesions.</i>						
Pulmonary Tb., Tb. Sternum, Dactylitis	1	—	—	—	1	.636
<i>Four Lesions.</i>						
Tb. Spine, Tb. Hip, Tb. Knee, Tb. Ankle	—	—	1	—	1	.636
<i>Non-Tuberculosis.</i>						
Chronic Blepharitis	—	—	1	—	1	.636
Left Hydronephrosis	—	—	—	1	1	.636
Osteomyelitis	—	—	1	—	1	.636
Osteomyelitis, Right Femur	—	—	—	1	1	.636
Osteomyelitis, Myocarditis, Anemia	—	1	—	—	1	.636
Legg-Perthes Disease	—	—	—	1	1	.636
Rectovesical Fistula	1	—	—	—	1	.636
Syphilis	1	—	—	—	1	.636
Ulcerative Colitis	—	1	—	—	1	.636
Unclassified	—	—	1	1	2	1.28
	2	2	3	4	11	—

TABLE 8. — *Condition on Discharge.*

	ADULTS.		CHILDREN.		Totals.	Percentage.
	Males.	Females.	Boys.	Girls.		
Arrested	5	2	7	8	22	16.42
Apparently Arrested	2	7	3	6	18	13.43
Quiescent	8	4	5	9	26	19.40
Improved	12	7	5	9	33	24.63
Unimproved	4	1	—	—	5	3.73
Died	5	4	4	3	16	11.94
Not Considered	4	2	1	—	7	5.23
Non-Tuberculosis	—	—	3	2	5	3.73
Inactive	—	1	—	1	2	1.49
	40	28	28	38	134	

TABLE 9. — *Deaths.*

DURATION OF DISEASE	Males.	Fe-males.	Boys.	Girls.	Totals.	LENGTH OF RESIDENCE IN SANATORIUM.				
						Males.	Fe-males.	Boys.	Girls.	Totals.
MONTHS.										
Less than 1	—	—	—	—	—	—	—	2	—	2
1 to 2	—	—	—	—	—	1	—	—	—	1
2 to 3	—	—	—	—	—	—	1	1	1	3
3 to 4	—	—	—	—	—	3	1	—	1	5
4 to 5	—	—	1	—	1	1	—	—	—	1
5 to 6	—	—	1	—	1	—	—	—	—	—
6 to 7	1	—	—	1	2	—	—	—	—	—
7 to 8	—	—	1	—	1	—	—	—	—	—
8 to 9	—	1	—	—	1	—	—	—	—	—
9 to 10	—	1	—	—	1	—	—	—	—	—
10 to 12	1	—	—	1	2	—	2	1	—	3
12 to 18	2	—	—	—	2	—	—	—	1	1
Over 24	1	2	1	1	5	—	—	—	—	—
	5	4	4	3	16	5	4	4	3	16

TABLE 10. — *Cause of Death.*

	Males.	Females.	Boys.	Girls.	Totals.
Tb. Cecum	—	—	1	—	1
Tb. Hip	—	1	—	—	1
Tb. Hip, Tb. Meningitis	—	—	—	2	2
Tb. Hip, Myocarditis	—	1	—	—	1
Tb. Nephritis, Pulmonary Tuberculosis	—	—	1	—	1
Tb. Peritonitis	1	1	1	—	3
Tb. Peritonitis, Tb. Meningitis	—	1	—	—	1
Tb. Sacro-iliac	1	—	—	—	1
Tb. Sacro-iliac, Pulmonary Tuberculosis, Tb. Meningitis	1	—	—	—	1
Tb. Spine, Acidosis	—	—	—	1	1
Tb. Spine, Tb. Meningitis	1	—	—	—	1
Tb. Spine, Ruptured Intra-spinal Cervical Abscess	—	—	1	—	1
Carcinoma, Uremia	1	—	—	—	1
	5	4	4	3	16

NORTH READING STATE SANATORIUM.

RESIDENT OFFICERS.

CARL C. MACCORISON, M.D., *Superintendent.*EARLE C. WILLOUGHBY, M.D., *Asst. Superintendent.*GERALD H. CARON, M.D., *Assistant Physician.*EMANUEL KLINE, D.M.D., *Dentist.*ELLEN MURRAY, R.N., *Superintendent of Nurses.*ETHEL M. KNIGHT, *Senior Bookkeeper and Treasurer.*CLARA J. GILL, *Head Housekeeper.*J. ELLIS DOUCETTE, *Steward.*DANIEL J. SCOTT, *Chief Engineer.*EDWARD J. LEARY, *Head Farmer.*TO GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the 19th annual report of the North Reading State Sanatorium for the year ending Nov. 30, 1927.

During the year there has been expended \$174,395.00 for maintenance, a gross weekly per capita cost of \$16.79. There has been collected from miscellaneous

sources \$68,411.07 (the total of all collections). Deducting this amount from the gross maintenance expenses leaves a net expense of \$105,889.88. The net weekly per capita cost was \$10.20. There has been collected from private funds \$5,933; from cities and towns \$61,402.16. Thirty-seven cases were supported wholly or in part by private funds; 304 were supported by cities and towns and 92 wholly by the State.

There were 183 patients at the Sanatorium at the beginning of the year, and 213 at the close. The largest number present at any one time was 213, and the smallest number was 169. The daily average number of patients was 199.61. There were 273 cases admitted during the year, 2 less than last year.

There were 227 cases admitted from cities and towns of over 25,000 population, and 46 cases from cities and towns under 25,000 population. The average age of patients was 13.71 years. Including deaths, there were 243 cases discharged, and the average duration of residence was 247 days. Of those discharged 197 gained 2,013 lbs. — an average gain of 10.21 lbs. per person. Of the discharges there were 26 Apparently Cured cases; 47 Apparently Arrested, 33 more than last year; 30 Arrested; 34 Quiescent; 50 Improved; 34 Unimproved. There were 10 patients Not Considered — the duration of treatment being less than one month. There were 10 deaths — 2 less than last year. There were 72,857 hospital days of treatment.

The following table shows the classification on the application blank and our classification on admission:

	Classification on Application Blanks.	Our Classifica- tion on Admis- sion.
Well	1	2
Bronchial Adenitis	1	26
Hilum Tuberculosis	94	141
Minimal	64	20
Moderately Advanced	63	46
Advanced	17	29
Cervical Adenitis	1	2
Incipient	3	0
Unclassified	29	7
	<hr/> 273	<hr/> 273

MEDICAL REPORT.

On the last day of the fiscal year there were only six adult patients remaining in the Sanatorium. Since early spring practically all wards and pavilions have been filled to capacity. All children admitted have received a routine dental examination, X-ray, intradermal test, Schick test, and when necessary, immunization and vaccination against smallpox. All employees have been vaccinated against smallpox. Food handlers, and those who work with the children, have been Schick tested, and those who have shown a susceptibility have been immunized. This group has also received typhoid paratyphoid immunization, and examination to detect typhoid carriers.

The need of more intensive nose and throat work is apparent. It is hoped that in the near future we may have a visiting nose and throat specialist on our staff.

During the last half of the present fiscal year we have admitted an increased number of apparently mental defectives. This has added greatly to our burden, not only as relating to the medical care of these abnormal children but to the teachers. If we are to continue to receive this type of case, we believe in justice to the normal child that we should be provided with separate wards for the care of these children.

Greater emphasis is being placed on posture work with most gratifying results.

The consultation clinics at Lowell and Woburn were discontinued December 26, 1927, owing to poor attendance. The Lawrence and Haverhill clinics have been held monthly. There has been a slight falling off at the Lawrence clinic — only 16 cases being referred during the year. Thirty-nine cases were referred to the Haverhill clinic. The work in the Out Patient clinic at the Sanatorium has

markedly increased, and it is hoped that this phase of the work can be extended this coming year. Of the 387 cases examined and X-rayed at the Sanatorium, 97 were found to have definite signs of either parenchymatous or hilum infection, 4 were negative and 249 were classified as suspicious. Of the Haverhill and Lawrence consultation cases, 20 were classified as positive; 34 as suspicious and one negative. Eight hundred and sixty-six X-ray films were made, and of this number 286 were made in the out patient clinic.

The following examinations were made in our laboratory: Sputum Examinations: Positive, 329; Negative, 546; Total, 875. Urine Analyses, 843; White Blood Counts, 77; Red Blood Counts, 5; Differential Blood Counts, 5; Babcock Milk Tests, 26; Throat Cultures, 40; Other Smears, 10; Widal tests, 179.

Report of Wassermann Tests.—Positive, 1; Negative, 19; Doubtful, 1; Total, 21.

DENTAL REPORT.

An attempt has been made to re-examine each patient every three months. The enormous amount of work required for the children admitted during the past few months has made this impossible, and with our present arrangement we will probably have to extend this re-examination period to every six months.

The following table is a summary of the work done during the year:

Total Number of Patients, 627; Total Number of Operations, 1,492; Total Number of Dismissals, 75.

Operative Work.—Examinations, 409; Prophylaxis, 222; Extractions (2 in bed), 225; Amalgam fillings, 223; Cement fillings, 151; Porcelain fillings, 51; Temporary fillings, 41; Gold fillings, 3; Roentgenograms, 27; Treatments, 75; Irrigations, 10; Crowns, 1; Dentures, 1; Dentures repaired, 1; Gingival treatments, 54; Smears for Vincents Angina, 3; Cases requiring Orthodontia, 45.

SANATORIUM SCHOOL.

We moved into the class rooms in the new school building in January. At the present time five class rooms are in use with a total enrollment of 207 and an average attendance of 172.42. Beginning with the fall term of school, instruction was provided for sixteen children of high school age, the courses consisting of history, civics, algebra, stenography and typewriting. A third teacher was appointed at this time.

IMPROVEMENTS.

Alterations to the center portion of Pavilion A East were completed in the early part of the summer. Owing to the necessity of providing additional quarters for employees, we found it impossible to complete the alterations to the central portion of Pavilion A West inasmuch as we needed what little money we had for the alterations to the old East and West cottages to fit them for the occupancy of non-tubercular employees.

The center portions of the East and West wards were shingled and the usual extensive repairs made to the verandas of the various wards and pavilions.

Work on the new icebox and refrigerating system and alterations to the kitchen are progressing satisfactorily. We moved into the new bakeshop the latter part of October. The new schoolhouse and employees' dormitory have been occupied to full capacity since late spring. There still remains a small amount of work to be done on this building. Improvements to our sewerage system were made approximating \$2,000.

RECOMMENDATIONS.

The center portions of Pavilions A East and West and C East, the Laboratory and north side of the Administration Building need to be reshingled; alterations to the center portion of Pavilion A West should be made; also the usual repairs to the verandas.

A carpenter and machine shop are badly needed; also additional improvement to the sewerage system.

Our fire protective system is also in need of rather extensive improvements and it has been recommended that \$7,000 be appropriated for this purpose.

ACKNOWLEDGMENTS.

We are indebted to our clergymen for their faithful religious services. The Rev. Herbert Jones resigned Dec. 31, 1926. At the present time the Protestant

services are being conducted by Rev. George Coffin and Rev. Clarence Chamberlain.

I wish to thank the numerous friends of the Sanatorium, especially the Big Brother Club, Kings' Daughters of Andover, American Legion Auxiliary of Reading and North Reading, and Junior Christian Endeavor Society of North Reading, for the numerous gifts of books, toys, etc.

EMPLOYEES.

Dr. Thomas W. Loft resigned on June 30, 1927, to devote his entire time to private practice and teaching. Dr. Emanuel W. Kline was appointed to fill the vacancy.

Miss Selma Roth, Superintendent of Nurses, resigned June 30, 1927, and Miss Ellen Murray, Assistant Superintendent of Nurses at the Rutland State Sanatorium, was appointed to fill the vacancy.

Miss Marguerite M. Murlless resigned as Teacher of Physical Training in September, 1927, to go to college. Miss Florence M. Schmits, a graduate of the Boston School of Physical Training, was engaged to fill this vacancy.

I am indebted to the staff, heads of departments, and other employees for their loyal services during the year.

Respectfully submitted,
CARL C. MACCORISON,
Superintendent.

VALUATION.

Land.

Grounds, 12.32 acres	\$593 45	
Lawns and Buildings, 11.57 acres.		
Roads, .75 acres.		
Woodland, 23.16 acres	1,115 62	
Mowing, 16.87 acres	812 63	
Tillage, 6.48 acres	312 14	
Tillage, .51 acres.		
Garden, 5.97 acres.		
Orchard, 3.99 acres	192 20	
Waste and Miscellaneous, 38.93 acres	1,875 25	
Rough Pasture, 8.17 acres.		
Meadow Swamp Land, 30.00 acres.		
Coal Trestle, .75 acres.		
	<hr/>	
	\$4,901 30	
Sewage System	10,258 31	
	<hr/>	\$15,159 61
<i>Buildings.</i>		
Institution Buildings	\$370,108 42	
Farm, Stable and Grounds	19,068 59	
Miscellaneous	104,812 43	\$493,989 44
	<hr/>	\$509,149 05
Present value of all personal property as per inventory of Nov. 30, 1927		103,952 37
		<hr/>
Grand Total		\$613,101 42

POPULATION.

	Males.	Females.	Totals.
Number received during the year	139	134	273
Number passing out of Institution during year	125	118	243
Number at end of fiscal year in Institution	104	109	213
Daily average attendance (number of inmates actually present during year)	97.53	102.08	199.61
Average number of employees and officers during year	46.44	40.93	87.37

EXPENDITURES.

<i>Current Expenditures:</i>		
1. Salaries and Wages	\$92,028 66	
2. Clothing	3,251 08	
3. Subsistence	58,662 07	
4. Repairs, Ordinary	2,976 47	
5. Office, Domestic and Outdoor Expenses	13,078 44	
	<hr/>	\$169,996 72
<i>Extraordinary Expenses:</i>		
1. Permanent Improvement to Existing Buildings		4,304 23
		<hr/>
		\$174,300 95

Summary of Current Expenses.

Total Expenditures	\$174,300 95
Deducting Extraordinary Expenses	169,996 72
Deducting amount of Sales	169,285 29

Dividing this amount by the daily average number of patients, 199.61, gives a cost for the year of \$848.08, equivalent to an average weekly net cost of \$16.31.

STATISTICAL TABLES.

TABLE I. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Sanatorium Dec. 1, 1926	90	93	183
Patients admitted from Dec. 1, 1926, to Nov. 30, 1927, inclusive	139	134	273
Patients discharged from Dec. 1, 1926, to Nov. 30, 1927, inclusive.	125	118	243
Patients remaining in Sanatorium Nov. 30, 1927	104	109	213
Daily average number patients	97.53	102.08	199.61
Deaths (included in number discharged)	4	6	10

TABLE II. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	127	122	249
Married	11	9	20
Widowed	1	3	4
Totals	139	134	273

TABLE III. — *Age of Patients Admitted.*

	Males.	Females.	Total.	Per-centage.
Birth	1	1	1	0.366
1 to 13 years	98	88	186	68.131
14 to 20 years	18	26	44	16.117
21 to 30 years	9	14	23	8.425
31 to 40 years	4	3	7	2.565
41 to 50 years	6	2	8	2.931
51 to 60 years	3	1	4	1.465
Over 60 years	—	—	—	0.000
Totals	139	134	273	100.000

Average Age of Patients, 13.71 years.

TABLE IV. — *Nativity and Parentage of Patients Admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.
United States	118	49	60	121	57	58	239	106	118
Massachusetts	108	36	48	112	45	46	220	81	94
Other N. E. States	7	10	7	4	6	5	11	16	12
Other States	3	3	5	5	6	7	8	9	12
Totals	118	49	60	121	57	58	239	106	118
Other Countries:									
Argentina	—	—	—	—	—	1	—	—	1
Armenia	2	3	3	—	—	—	2	3	3
Austria	—	—	1	—	1	1	—	1	2
Bermuda	—	—	1	—	—	—	—	—	1
Canada	8	27	23	5	15	14	13	42	37
Cape Verde Islands	—	1	1	—	—	—	—	1	1
Denmark	—	1	1	—	1	—	—	2	1
District of Columbia	—	—	1	—	—	—	—	—	1
England	—	4	—	—	4	3	—	8	3
Finland	—	—	1	—	—	—	—	—	1
France	—	—	—	—	—	2	—	—	2
Germany	—	—	—	—	—	1	—	—	1
Greece	—	—	—	—	3	2	—	3	2
Holland	—	—	—	—	1	—	—	1	—
Ireland	2	13	17	1	12	14	3	25	31
Italy	2	16	11	2	19	14	4	35	25
Lithuania	—	1	1	—	—	—	—	1	1
Norway	1	1	1	—	—	—	1	1	1
Poland	—	2	1	—	4	4	—	6	5
Portugal	—	—	—	1	2	1	1	2	1
Roumania	—	—	—	—	1	1	—	1	1
Russia	3	8	8	2	6	9	5	14	17
Scotland	2	4	4	1	2	4	3	6	8
Spain	—	—	—	—	1	—	—	1	—
Sweden	1	2	1	—	—	1	1	2	2
Switzerland	—	2	—	1	2	2	1	2	2
Syria	—	2	2	—	—	—	—	2	2
West Indies	—	2	1	—	—	1	—	2	2
Total Foreign	21	87	79	13	74	75	34	161	154
Unknown	—	3	—	—	3	1	—	6	1
Grand Totals	21	90	79	13	77	76	34	167	155
	139	139	139	134	134	134	273	273	273

TABLE V. — *Residence of Patients Admitted.*

Amesbury, 1	Graniteville, 2	Peabody, 4
Arlington, 3	Haverhill, 7	Quincy, 6
Ballardvale, 1	Hingham, 2	Reading, 3
Belmont, 1	Lawrence, 2	Revere, 5
Beverly, 2	Lowell, 6	Salem, 4
Boston, 116	Lynn, 11	Somerville, 5
Brookline, 5	Malden, 5	Stoughton, 1
Cambridge, 10	Maynard, 1	Townsend Harbor, 1
Canton, 1	Medford, 1	Waban, 1
Chelsea, 6	Melrose, 2	Wakefield, 1
Dedham, 1	Merrimac, 1	Waltham, 2
East Saugus, 1	Methuen, 2	Weston, 1
Everett, 8	Newburyport, 1	Wilmington, 1
Fall River, 18	Newton, 3	Winchester, 2
Fitchburg, 3	No. Chelmsford, 1	Winthrop, 1
Framingham, 2	No. Reading, 3	Woburn, 1
Gloucester, 4	No. Westport, 1	Total, 273

TABLE VI. — *Occupation of Patients Admitted.*

	Males.	Females.		Males.	Females.
Attendant	1	—	Saleswoman	—	1
Baker	1	—	Seamstress	—	1
Butcher	1	—	Shoe Worker	1	—
Chaufeur	2	—	Steamfitter	1	—
Clerk	2	—	Stenographer	1	1
Dressmaker	—	1	Student	97	97
Electric Railway Conductor	1	—	Tailor	2	—
Factory Worker	3	5	Teacher	1	—
Governess	—	1	Telephone Installer	1	—
Housewife	—	10	Telephone Operator	—	2
Houseworker	—	1	Waitress	—	1
Lab. Assistant	1	—	Waiter	1	—
Laborer	1	—	Wire Inspector	1	—
Meat Cutter	1	—	None	16	12
Nurse	—	1			
Publisher	1	—	Total	139	134
Roofer	1	—			
Salesman	1	—			

Grand Total, 273.

TABLE VII. — *Stage of Disease on Admission.*

	ADULTS.				CHILDREN (UNDER 18 YEARS).			
	Males.	Fe-males.	Totals.	Per-centage.	Males.	Fe-males.	Totals.	Per-centage.
Well	—	—	—	—	1	1	2	0.900
Bronchial Adenitis	—	—	—	—	17	9	26	11.711
Hilum Tuberculosis	—	—	—	—	73	68	141	63.514
Minimal	2	—	2	3.922	5	13	18	8.109
Moderately Advanced	14	12	26	50.980	7	13	20	9.009
Advanced	10	13	23	45.098	3	3	6	2.703
Cervical Adenitis	—	—	—	—	—	2	2	0.900
Unclassified	—	—	—	—	7	—	7	3.154
Total	26	25	51	100%	113	109	222	100%

TABLE VIII. — *Condition on Discharge.*

	ADULTS.				CHILDREN (UNDER 18 YEARS).			
	Males.	Fe-males.	Totals.	Per-centage.	Males.	Fe-males.	Totals.	Per-centage.
Well	—	—	—	—	1	1	2	1.3
Apparently Cured	—	—	—	—	16	10	26	15.9
Arrested	—	—	—	—	19	11	30	18.4
Apparently Arrested	3	—	3	3.5	16	28	44	26.9
Quiescent	9	8	17	21.5	8	9	17	10.4
Improved	17	13	30	37.5	11	9	20	12.4
Unimproved	14	10	24	30.0	1	9	10	6.1
Died	2	2	4	5.0	2	4	6	3.8
Not Considered	1	1	2	2.5	5	3	8	4.8
Total	46	34	80	100%	79	84	163	100%

TABLE IX. — *Deaths.*

DURATION OF DISEASES.	Males.	Fe- males.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Fe- males.	Totals.
Under 1 month.	—	—	—	1	1	2
1 to 2 months	—	—	—	—	1	1
2 to 3 months	—	—	—	—	—	—
3 to 4 months	—	—	—	—	1	1
4 to 5 months	—	—	—	1	—	1
5 to 6 months	—	—	—	—	2	2
6 to 7 months	—	—	—	—	—	—
7 to 8 months	—	—	—	—	—	—
8 to 9 months	—	—	—	—	—	—
9 to 10 months	—	—	—	—	1	1
10 to 12 months	—	—	—	—	—	—
12 to 18 months	—	2	2	—	—	—
18 to 24 months	—	1	1	1	—	1
Over 2 years	4	3	7	1	—	1
Totals	4	6	10	4	6	10

TABLE X. — *Cause of Death.*

	Males.	Females.	Totals.
Tuberculosis of Lungs	4	6	10

RUTLAND STATE SANATORIUM.

RESIDENT OFFICERS.

ERNEST B. EMERSON, M.D., *Superintendent.*
 WILLIAM B. DAVIDSON, M.D., *Asst. Superintendent.*
 PAUL DUFAULT, M.D., *Senior Physician.*
 ARMAND LAROCHE, M.D., *Assistant Physician.*
 ANTOINE DUMOUCHEL, M.D., *Assistant Physician.*
 LEOPOLD BALTHAZARD, M.D., *Assistant Physician.*
 DELYA E. NARDI, *Superintendent of Nurses.*
 MARY A. BOYLE, *Senior Bookkeeper and Treasurer.*
 CORA A. PHILLIPS, *Head Housekeeper.*
 OLIN C. BLAISDELL, *Steward.*
 HARRY U. WENDELL, *Chief Engineer.*
 JOSEPH A. CARROLL, *Head Farmer.*

NON-RESIDENT OFFICERS.

FRANK H. WASHBURN, M.D., *Consulting Surgeon.*
 WILLIAM J. O'CONNOR, D.M.D., *Dentist.*

REPORT OF THE SUPERINTENDENT.

TO DR. GEORGE H. BIGELOW, *Commissioner, Department of Public Health.*

I have the honor to submit the thirty-first annual report of the Rutland State Sanatorium for the year ending November 30, 1927.

During the year there has been expended \$313,743.87, for maintenance, a gross weekly per capita cost of \$16.90. There has been expended from Special Appropriation authorized by Chapter 398, Acts 1926, \$4,133.35; from Special Appropriation authorized by Chapter 211, Acts 1925, \$470.00; from Special Appropriation authorized by Chapter 347, Acts 1925, \$4,639.19; from Special Appropriation authorized by Chapter 79, Acts 1926, \$6,978.23.

There has been collected from miscellaneous sources (the total of all collections) \$294,580.04, an increase of 18.69 per cent over the collection of last year. Deducting this amount from the gross maintenance expense leaves a net expense of \$19,163.83, a net weekly per capita cost of \$1.03. There has been collected from private sources \$11,828.03; from cities and towns \$52,576.59; from Worcester County \$60,527.50; from Middlesex County \$140,322.50; from the Attorney General \$4,949.14; from the United States Veterans Bureau \$449.86; from the Tubercular Hospital District of Chelsea, Revere and Winthrop \$22,615.00.

Twenty-five cases were supported wholly or in part from private funds; fifty-two by cities and towns; twenty-four wholly by the State; one hundred and fifty-

three by Middlesex County; fifty-nine by Worcester County, and twenty-seven by the Tubercular Hospital District of Chelsea, Revere and Winthrop. There were twenty cases on which settlement had not been determined.

There were 363 patients in the sanatorium at the beginning of the year, 353 at the close. The largest number present at one time was 368, and the smallest 342. The daily average number of patients was 357.02, an increase of 2.55. There were 488 patients admitted during the year, 24 more than last year; 62 minimal, 162 moderately advanced, 241 far advanced and 23 unclassified. There were 280 admitted from cities and towns of over 25,000 population and 208 from cities and towns under 25,000 population. The average age of patients admitted was 30.82, a decrease of .06. Including deaths there were 498 patients discharged, 48 more than last year. Of those discharged, 305 gained 3,480.50 pounds, an average gain of 11.41 pounds per person. Of the discharges there were 3 arrested cases, 4 less than last year, 18 apparently arrested cases, 8 more than last year, 204 quiescent cases, 23 more than last year, 66 improved, 77 unimproved and 31 not considered, the duration of treatment being less than one month. There were 11 discharged non-tuberculous. There were 88 deaths, 14 less than last year. There were 130,314 days of treatment, 930 more than last year.

The following table shows the classification on the application blank and our classification on admission:

	CLASSIFICATION ON APPLICATION BLANKS.		OUR CLASSIFICATION ON ADMISSION.		PER CENT.	
	1926.	1927.	1926.	1927.	1926.	1927.
Minimal	125	107	65	62	14.01	12.70
Moderately advanced	255	282	131	162	28.23	33.20
Far advanced	67	69	245	241	52.80	49.39
Unclassified	17	30	23	23	4.96	4.71
	<u>464</u>	<u>488</u>	<u>464</u>	<u>488</u>		

It is interesting to note the apparent effect of the county contracts on the types of cases admitted, and the mortality rate. The Worcester County contract went into effect May, 1925, Middlesex County contract June, 1925, and the Chelsea, Revere and Winthrop Hospital District contract in September, 1925, approximately two and one-half years in operation. For purposes of comparison, the admissions and deaths of years 1922 to 1924 inclusive, and the years 1925 to 1927 inclusive are considered: during the period 1922 to 1924 inclusive there were admitted 276 or 19.31 per cent minimal cases, 495 or 34.78 per cent moderately advanced cases, and 594 or 41.78 per cent advanced cases. From 1925 to 1927 inclusive, there were admitted 198 or 13.52 per cent minimal cases, 435 or 29.70 per cent moderately advanced cases, and 761 or 51.93 per cent far advanced cases. From 1922 to 1924 inclusive there were 169 deaths, and from 1925 to 1927 inclusive there were 275 deaths, an increase of 106 deaths. The increase in the number of deaths follows roughly the increase in the number of far advanced cases, or as otherwise indicated, the number of deaths increases as the number of minimal and second stage cases decreases. There were 9 deaths, approximately 10 per cent within one month of admission, 23 deaths, approximately 26 per cent within 2 months, and 43 deaths within 4 months, approximately 49 per cent of the total number. A part of these, at least, should never have been subjected to the hardship of a transfer by automobile or ambulance.

These figures indicate a decided trend toward a hospital for chronic cases rather than a sanatorium with the prospect of cures. This institution, designed primarily for the treatment of early and favorable cases, is not adapted for the care of so large a proportion of the hospital type; the open wards are too large for these cases, and there is not a sufficient number of single rooms to care for those requiring quiet and special attention.

Laboratory Report. — The following is a report of the work done in the laboratory during the year: Urine examinations: Routine, 575; 24 hour specimens, 9; Total, 584. Sputum examinations for the tubercle bacilli: Positive, 2,834; No tubercle bacilli found, 4,678; Total, 7,512. Blood counts, 36; Guinea Pig inoculations, 34;

Smears for differentiation of bacteria, 29; Cultures, 10; Widal reactions, 288; Blood coagulation time, 9; Bacteriological examination of milk, 18; Cultures made for further examination for bacillus typhosus: From urine, 88; From feces, 87; Total, 175. Blood drawn for Wassermann Test: Negative, 415; Positive, 19; Doubtful, 8; Total, 442.

Of the total number of patients remaining in the sanatorium November 30, 1927, (353), 13 report no sputum, 77.6% have positive sputum and 22.4% tubercle bacilli not found; 315 smallpox vaccinations; 206 Typhoid and Paratyphoid A and B; 849 X-ray plates of chest and 75 X-ray plates of teeth.

Lectures. — Twenty-four lectures in bacteriology were given to Nurses' Training School.

Dentistry. — The following is a summary of the dental work done during the year: Office visits, 2,741; Mouth washes, 306; Amalgam fillings, 272; Cement fillings, 140; Gutta Percha fillings, 222; Temporary fillings, 196; Surgical dressings, 6; Extractions, 478; Post extraction, 308; Vincent's Disease, 15; Gingivitis, 36; Syphilitic Ranular, 4; Trismus, 1; Abscess cases, 156; Abscesses treated, 148; Stomatitis, 64; Bed treatments, 42; Bone dissections, 6; Hemorrhages checked, 2; Inlays, 34; Plates repaired, 28; Bridges, 36; Crowns, 47; Extractions under novocaine, 452; Extractions under ethyl chloride, 26; Prophylactics, 289; X-rays, 75; Pulp treatments, 12; Tuberculous mouth, 1; Tuberculous tongue, 1; Impacted teeth extracted, 12; Repairs to bridges, 3; Teeth extracted at bedside, 36; Mercurial stomatitis, 2.

Consultation Clinics. — The following tables indicate the work of the consultation service, clinics, out-patients and others:

Consultation: Number of patients examined, 196. Diagnosis: Tuberculosis, 75; Non-tuberculous, 41; Observation, 80.

One hundred and ninety-six consultation cases reported for 226 examinations, and 35 ex-patients reported for 50 follow-up examinations, making a total of 276 examinations at the consultation clinics.

Number of patients examined: Once, 178; Twice, 6; Three times, 12.

Number of ex-patients examined: Once, 24; Twice, 10; Six times, 1.

Number of physicians referring patients, 74.

There were 20 patients admitted to the sanatorium following examinations at the consultation clinics.

Sanatorium — Out-patient: Patients referred by physicians, 101; Patients examined at own request, 141; Total, 242. Diagnosis: Tuberculosis, 70; Non-tuberculous, 46; Observation, 69.

One hundred and eighty-five patients reported for 198 examinations and 157 ex-patients reported for 230 examinations, making a total of 428 examinations at the sanatorium.

Number of patients examined: Once, 172; Twice, 13.

Number of ex-patients examined: Once, 98; Twice, 48; Three times, 9; Four times, 1; Five times, 1.

Number of physicians referring patients, 60.

There were 21 patients admitted to the sanatorium following examinations at the sanatorium.

There were 11 patients examined at other sanatoria. Diagnosis: Tuberculosis, 10; Non-tuberculous, 1.

The total of all examinations made during the year, exclusive of routine work, was 715.

PERSONNEL.

The following resignations from the Staff and appointments have been made during the year:

Dr. Hermenegilde Vachon, appointed assistant physician December 6, 1926, resigned because of illness December 29, 1926.

Dr. Jean Albert Joannette, appointed assistant physician March 8, 1926, resigned September 10, 1927, to study abroad.

Dr. Mark H. Joress, appointed assistant physician October 12, 1922, resigned October 11, 1927, to enter private practice in Boston. Doctor Joress rendered

efficient and conscientious service to the sanatorium during his period of service and left to continue the practice of his specialty.

Dr. Paul Dufault, resigned January 3, 1927, and was re-appointed senior physician November 1, 1927.

Dr. Armand Laroche, a graduate of the University of Montreal, was appointed assistant physician February 3, 1927.

Dr. Antoine Dumouchel, a graduate of the University of Montreal, was appointed assistant physician June 1, 1927.

Dr. Leopold Balthazard, a graduate of the University of Montreal, was appointed assistant physician October 5, 1927.

The change of personnel and the vacancies between resignations and appointments have made it most difficult to maintain the standard of medical work, to say nothing of improving the service. It is confidently expected that the new salary schedules will have a tendency to make a more permanent medical staff.

TRAINING SCHOOL FOR NURSES.

The Training School for Nurses is now entering its twentieth year. The following affiliations supplement the course given at the sanatorium: Cooley-Dickinson Hospital, obstetrics and surgery, Worcester City Hospital, pediatrics and medicine, and Worcester State Hospital, mental diseases. There are 32 pupil nurses: 8 seniors, 7 intermediates, 7 juniors and 10 probationers.

The following have been awarded diplomas:

Anna Frances Igoe	Clarence A. Pond
Rena Blanche Nauss	James A. Hally
Anna Gertrude Dennehy	Mary Elizabeth Mulligan
Mary Catherine Farrell	Alice Claire Mulvey

Miss Ellen E. Murray, Assistant Superintendent of Nurses, resigned June 30, 1927, to accept the position of Superintendent of Nurses at the North Reading State Sanatorium.

Miss Rena Blanche Nauss was appointed Assistant Principal, School of Nursing, Oct. 18, 1927.

Supplementing the instruction given by the Staff the following physicians have given a course of lectures during the year: Dr. G. Arnold Rice and Dr. Joseph Muller.

PUBLICATIONS AND PROJECTS.

A paper entitled, "Treatment of Pulmonary Tuberculosis," by Ernest B. Emerson, M.D., was published in the Boston Medical and Surgical Journal, September 15, 1927.

The following projects have been completed:

Morgue, Chapter 211, Acts 1925	\$1,095.37
Additional Refrigeration, Chapter 79, Acts 1926	7,748.69
Fire Protection, Chapter 347, Acts 1925	5,371.36
Sprinkler System, Chapter 398, Acts 1926	4,890.56

Retubing of two boilers and repairs to the chimney have been completed.

A portable X-Ray machine, a silo, two washers and a road scraper have been purchased.

RECOMMENDATIONS.

Preliminary plans and estimates are submitted for an employee's building for the housing of 44 employees. It is estimated that \$71,500.00 will be required for the building and \$5,500.00 for furnishings, a total of \$77,000.00. At the present time approximately one-half the women employees are housed in dormitories or rooms adjacent to or opening into ward corridors, and sharing toilet and locker room facilities with the patients. The rooms and dormitories now occupied by these employees are needed more than ever for the proper care of our patients, particularly the terminal cases.

The installation of sprinklers through a part of the basements, locker rooms and corridors has in a measure ameliorated the fire risk. There still exists, however, a fire hazard that is appalling. During the winter there are many nights

when help from the outside could by no possibility be obtained, and one shudders with the blizzards at the thought of 500 people, over 225 of whom are bed patients, being turned out at night with shelter miles away and available only on snowshoes. I recommend the installation of a fire pump, an auxiliary tank and the completion of the sprinkler system at an estimated cost of \$35,000.00.

To meet the increasing demands on the medical service in the sanatorium, and the consultation clinics, the appointment of an X-ray technician is recommended in order that the time of the higher salaried physician now doing this detail may be available for clinical work.

ACKNOWLEDGMENTS.

We note with sorrow the passing of Miss Sarah Copello, a former patient, and head nurse for ten years following her graduation from the Training School. Miss Copello's example of courage and serenity against the odds of ill health is an inspiration for the ordinary day's routine.

The Reverend Father McNamara, the Reverend Father Smith, the Reverend Mr. French and Rabbi Bloom have not only ministered to the spiritual welfare of our people but have been of the greatest assistance in the more material affairs of the sanatorium.

I wish to acknowledge with gratitude the co-operation, loyalty, and spirit of the employees which make possible whatever measure of good there may be.

Again, I am grateful for your confidence, consideration and counsel.

Respectfully,

ERNEST B. EMERSON,
Superintendent.

VALUATION. *Land.*

Grounds, 44.417 acres	\$17,131 80	
Lawns and buildings, 34.417 acres.		
Roads, 10.00 acres.		
Woodland, 93.30 acres	3,221 60	
Mowing, 72.73 acres	7,273 00	
Tillage, 28.00 acres	2,800 00	
Tillage, 24.98 acres.		
Garden, 3.02 acres.		
Pasture, 90.44 acres	4,607 15	
Orchard, .99 acres	198 00	
Waste and Miscellaneous, 34.85 acres	1,624 75	
Rough Pasture, 10.15 acres.		
Meadow Swamp, 18.22 acres.		
Sewer Beds, 5.98 acres.		
Coal Trestle, .50 acres.		
Sewerage System	15,508 32	
		\$52,364 62
<i>Buildings.</i>		
Institution Buildings	\$543,394 74	
Farm, Stable and Grounds	34,125 00	
Miscellaneous	74,658 25	\$652,177 99
		\$704,542 61
Present value of all personal property as per inventory of Nov. 30, 1927		94,041 77
Grand Total		\$798,584 38

POPULATION.

	Males.	Females.	Totals.
Number received during the year	263	225	488
Number passing out of the Institution during the year	272	226	498
Number at end of fiscal year in the Institution	178	175	353
Daily average attendance (number of inmates actually present during the year)	181.31	175.71	357.02
Average number of employees and officers during the year	122.30	71.86	194.16

EXPENDITURES.

<i>Current Expenditures:</i>			
1. Personal Services	\$150,937 13		
2. Clothing.	189 97		
3. Subsistence	78 538 87		
4. Ordinary Repairs	8,358 19		
5. Office, Domestic and Outdoor Expenses	68,902 90		
Extraordinary Expenses:			\$306,927 06
1. Permanent improvements to existing buildings		6,816 81	
			\$313,743 87

Summary of Current Expenses.

Total Expenditure	\$313,743 87	
Deducting Extraordinary Expenses	6,816 81	
		\$306,927 06
Deducting amount of sales		951 26
		\$305,975 80

Dividing this amount by the daily average number of patients, 357.02, gives a total cost for the year of \$857.02, equivalent to an average weekly net cost of \$16.4811.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Sanatorium Nov. 30, 1926	187	176	363
Patients admitted Dec. 1, 1926, to Nov. 30, 1927, inclusive	263	225	488
Patients discharged Dec. 1, 1926, to Nov. 30, 1927, inclusive,	272	226	498
Patients remaining in Sanatorium Nov. 30, 1927	178	175	353
Daily average number of patients	181.31	175.71	357.02
Deaths (included in number discharged)	51	37	88

TABLE 2. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	106	118	224
Married	138	96	234
Widowed	17	10	27
Divorced	2	1	3
	263	225	488

TABLE 3. — *Age of Patients Admitted.*

	Males.	Females.	Totals.	Per-centage.
Under 14 years	—	—	—	—
14 to 20 years	20	30	50	10.24
20 to 30 years	89	103	192	39.35
30 to 40 years	67	57	124	25.41
40 to 50 years	51	24	75	15.37
Over 50 years	36	11	47	9.63
Average age	28.70	33.92	30.82	—
	263	225	488	—

TABLE 4. — *Nativity and Parentage of Patients Admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	140	35	37	142	43	36	282	78	73
Other New England States	21	16	19	11	10	13	32	26	32
Other States	9	8	7	7	7	2	16	15	9
Total Native	170	59	63	160	60	51	330	119	114
Other Countries (29):									
Total Foreign	93	199	200	65	161	168	158	360	368
Unknown	—	5	—	—	4	6	—	9	6
Grand Totals	263	263	263	225	225	225	488	488	488

TABLE 5. — *Residence of Patients Admitted.*

Place	Number	Place	Number	Place	Number
Arlington, 6		Concord, 2		Lancaster, 1	
Ashby, 1		Deerfield, 1		Leicester, 1	
Ashland, 3		Dodge, 1		Leominster, 5	
Athol, 2		Dracut, 1		Lexington, 2	
Ayer, 3		Dudley, 2		Linwood, 1	
Barre, 1		Everett, 20		Lowell, 2	
Belmont, 2		Fall River, 5		Malden, 24	
Blackstone, 2		Farnumsville, 3		Manchaug, 1	
Boston, 78		Framingham, 7		Marlboro, 5	
Braintree, 1		Gardner, 14		Maynard, 4	
Brockton, 2		Graniteville, 1		Medford, 8	
Brookfield, 1		Groton, 1		Melrose, 4	
Brookline, 2		Haverhill, 2		Milford, 7	
Cambridge, 12		Holden, 2		Millbury, 1	
Chartley, 1		Holyoke, 2		Millville, 1	
Chelmsford, 3		Hopedale, 2		Natick, 5	
Chelsea, 18		Hubbardston, 1		Newton, 19	
Cliftondale, 1		Hudson, 8		Northbridge, 2	
Clinton, 6		Jefferson, 1		North Brookfield, 2	

TABLE 5. — *Residence of Patients Admitted.* — Concluded.

Place	Number	Place	Number	Place	Number
North Chelmsford, 1		Southbridge, 10		Webster, 11	
Oakham, 1		South Hadley, 1		Westboro, 2	
Pepperell, 1		Spencer, 1		West Brookfield, 1	
Plymouth, 1		Springfield, 2		Westford, 1	
Quincy, 1		Stoneham, 6		Whitinsville, 3	
Reading, 7		Stoughton, 1		Wilmington, 1	
Revere, 15		Sturbridge, 1		Winchendon, 2	
Rutland, 1		Tewksbury, 1		Winchester, 2	
Saugus, 2		Uxbridge, 1		Winthrop, 2	
Saxonville, 1		Wakefield, 6		Woburn, 4	
Sherborn, 1		Waltham, 11		Worcester, 18	
Shirley, 1		Watertown, 10		Total, 488	
Somerville, 39		Waverley, 2			

TABLE 6. — *Occupation of Cases Admitted.*

	Males.	Females.		Males.	Females.
Actor	1	—	Lithographer	1	1
Agent, Insurance.	1	—	Logger	1	—
Architect	1	—	Loomfixer	1	—
Artist	—	1	Machinist	13	—
Attendant	1	2	Machinist's Helper	1	—
Author	1	—	Mail Carrier	3	—
Automobile Demonstrator.	1	—	Manager, Store	2	—
Automobile Painter	1	—	Mason	1	—
Baker	1	—	Mechanic	2	—
Barber	1	—	Merchant	6	—
Bell Boy	1	—	Messenger	1	—
Bookkeeper	3	5	Meter Tester	2	—
Bricklayer	1	—	Mill Hand	8	4
Butcher	3	—	Millwright	1	—
Cabinet Maker	2	—	Musician	1	—
Candy Maker	—	1	Navigator, Master	1	—
Carpenter	4	—	No Occupation	1	13
Cashier	1	1	Nurse, Graduate	—	7
Cattle Dealer	1	—	Nurse, Student	—	3
Cement Finisher	1	—	Nurse, Practical	—	1
Chambermaid	—	1	Nursemaid	—	1
Chauffeur	8	—	Painter	4	—
Chorus Girl	—	1	Painter and Paper Hanger	1	—
Clergyman	2	—	Plumber	3	—
Clerk	24	12	Plumber's Helper	1	—
Comptometer Operator	—	1	Policeman	1	—
Conductor	1	—	Porter	2	—
Cook	—	1	Printer	4	—
Cutter, Dress	1	—	Rag Sorter	1	—
Dentist	2	—	Realtor	1	—
Diemaker	1	—	Saleslady	—	2
Draftsman	2	—	Salesman	8	—
Dressmaker	—	3	Seamstress	—	1
Dyer	2	—	Secretary	—	3
Editorial Reader	—	1	Servant	—	2
Electrician	2	—	Shipper	1	—
Engraver, Photo	1	—	Shoeworker	1	—
Embroiderer	—	1	Stenographer	—	15
Factory	41	18	Stone Cutter	3	—
Farmer	1	—	Stone Driller	1	—
Farmland	2	—	Student	7	7
Fireman	3	—	Teacher	1	2
Floorman, Garage	1	—	Tailor	2	—
Foreman, Assistant	1	—	Telephone Installer	2	—
Forest Fire Observer	1	—	Telephone Operator	—	7
Freight Handler	1	—	Teller, Bank	1	—
Gardener	2	—	Tile Setter	1	—
General Worker	9	1	Timekeeper	1	—
Hairdresser	—	1	Toolmaker	1	—
Hoisting Engineer	1	—	Typist	—	1
Housewife	—	79	U. S. Custom Officer	1	—
Housework	—	19	Upholsterer	3	—
Ice Dealer	1	—	Watchmaker	1	1
Inspector, Bridge	1	—	Waitress	—	4
Inspector, Optical	—	1	Weaver	3	—
Janitor	3	—	Weigher	1	—
Junk Collector	1	—	Window Glazier	1	—
Laborer	14	—	Wireworker	1	—
Lineotype Operator	2	—	Wood Chopper	1	—

Total number of occupations, 118. Number of males, 263; number of females, 225; Total, 488.

TABLE 7. — *Stage of Disease at Admission.*

	Males.	Females.	Totals.	Percentage.
Minimal	26	36	62	12.70
Moderately advanced	93	69	162	33.20
Far advanced	133	108	241	49.39
Unclassified	11	12	23	4.71
Totals	263	225	488	—

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Arrested	1	2	3	.60
Apparently arrested	8	10	18	3.62
Quiescent	110	94	204	40.96
Improved	40	26	66	13.25
Unimproved	37	40	77	15.46
Deaths	51	37	88	17.67
Non-tuberculous	6	5	11	2.21
Not considered	19	12	31	6.23
	272	226	498	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Fe- males.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Fe- males.	Totals.
Under 1 month.	—	—	—	6	3	9
1 to 2 months	—	—	—	8	6	14
2 to 3 months	—	—	—	4	2	6
3 to 4 months	—	1	1	8	6	14
4 to 5 months	2	1	3	3	3	6
5 to 6 months	2	—	2	2	2	4
6 to 7 months	2	—	2	2	2	4
7 to 8 months	3	1	4	4	2	6
8 to 9 months	1	1	2	1	1	2
9 to 10 months	—	2	2	2	—	2
10 to 12 months	2	—	2	—	1	1
12 to 18 months	15	7	22	3	2	5
18 to 24 months	2	13	15	5	2	7
Over 2 years	22	11	33	3	5	8
	51	37	88	51	37	88

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Pulmonary tuberculosis	50	36	86
Myocarditis	—	1	1
Lymphosarcoma	1	—	1
	51	37	88

WESTFIELD STATE SANATORIUM.

RESIDENT OFFICERS.

HENRY D. CHADWICK, M.D., *Superintendent.*ROY MORGAN, M.D., *Assistant Superintendent.*HEMAN B. CHASE, M.D., *Assistant Physician.*HUBERT A. BOYLE, M.D., *Assistant Physician.*GEORGE E. CROWELL, D.M.D., *Dentist.*EMILY B. MORGAN, *Supt. of Nurses and Matron.*SARA R. SKERRY, *Dietitian.*JOSEPHINE E. FRENCH, *Senior Bookkeeper and Treasurer.*JOHN E. KINSELLA, *Steward.*BENJAMIN J. SANDIFORD, *Chief Engineer.*WILLIAM G. ATKINSON, *Head Farmer.*To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the eighteenth annual report of the Westfield State Sanatorium for the year ending November 30th, 1927.

During the year there has been expended \$250,343.59 for Maintenance, a gross weekly per capita cost of \$17.63.

There has been collected from miscellaneous sources \$85,617.67. Deducting this amount from the gross maintenance expense leaves a net expense of \$164,725.92, or a net weekly per capita cost of \$11.60. There has been collected from private funds \$7,401.00; from cities and towns \$74,728.24. 39 cases were supported wholly or in part from private funds; 138 by cities and towns; 67 wholly by the state; 23 by the Department of Public Welfare; 53 status undetermined; 1 part city and part state.

We had 269 patients at the beginning of the year and 275 at the close. Our daily average was 273.02. The largest number present was 300, the smallest 234. Total of cases admitted was 321. These were classified as shown by the following statistics:

Non-tuberculous, 7; No disease, 16; Malnutrition, 30; Adenitis, 1; Cervical adenitis, 3; Hilum tuberculosis, 148; Minimal, 33; Moderately advanced, 42; Advanced, 31; Pulmonary abscess, 2; Bronchial asthma, 1; Pott's disease, 2; Empyema, 1; Bronchiectasis, 2; Chronic endocarditis, 1; Unclassified, 1; Total, 321.

209 cases were admitted from cities and towns of over 25,000 population; 112 from cities and towns of less than 25,000. The average age of patients was 13.52 years. There were 315 discharges. Of these 57 were Apparently Well; 138 Apparently Arrested; 68 Improved; 16 Unimproved; 14 were not considered as they stayed less than 30 days. There were 22 deaths. Of those discharged 280 gained 3,049 pounds, or an average of 10.8 pounds. There were 82,166 hospital days of treatment.

COMMENT.

Our gross per capita cost has been \$1.30 per week higher than the previous year. This is due to the following reasons:

To the substantial increase in salaries that was made as of June 1st amounting to \$12,000.

\$9,000 more than the previous year was expended for repairs and renewals.

\$6,000 additional was expended for heat, light and power so that we could have sufficient coal to carry us into April of the following year.

The breakdown in our boilers the preceding year and the installation of the new ones had made a deficit in the tonnage of coal that was carried over.

Another reason was the smaller average number of patients cared for, which was 10 less than the previous year.

Receipts were \$2,961.16 less than the previous year. The number of private patients increased from 18 to 39 but those paid for by cities and towns decreased from 198 to 138, and the number of state cases increased from 50 to 67.

CLINICS.

We are now holding monthly Consultation Clinics only in Pittsfield and Adams. The number examined in the Consultation Clinics was 17 less than last year but this is because the clinics in Holyoke were discontinued as the physicians there preferred to send their patients to the sanatorium where they could have the benefit of an X-Ray examination. The number of patients examined at the sanatorium increased by 305. More physicians in the neighboring territory are sending their patients here for diagnosis than ever before. Owing to the activity of the nurses of the Hampden County Tuberculosis Association, we were called on to examine 474 more children than in any previous year. The tables below show the extent of this sanatorium work. It has grown to such an extent that much of the time of one physician is needed to examine the Out-Patients. Two members of the staff are needed for the examination clinics in the schools where the State Clinic System is carried out. This work of the sanatorium staff in co-operation with the Hampden County Tuberculosis Association supplements and takes the place of the State Clinics in the small towns of Hampden County. 24 of these clinics were held in Hampden County; 5 in Franklin County, and we assisted Dr. O'Brien at one clinic in Hampshire County.

	Positive.	Negative.	Suspicious.	Re-examined.	Total.
1. Consultation Clinics	15	26	21	27	89
2. Examination Clinics	9	913	134	447	1,503
3. Out-Patients	92	415	81	238	826
	116	1,354	236	712	2,418

This shows that 116 new cases of tuberculosis were diagnosed in these clinics, or 4.3% of the total number examined.

Out-Patient X-Rays 755

PUBLICITY.

I have addressed 27 different meetings of teachers, mothers' clubs, Parent-Teacher Associations, public health organizations, farm bureaus, rotary clubs and medical societies on the work of the Ten-Year Program and Juvenile Tuberculosis. In addition I have read papers before the Massachusetts Medical Society, the American Medical Association, the American Sanatorium Association and the New Jersey State League; also before the Central District Public Health Association of Syracuse, N. Y., and the National Association of Life Insurance Medical Directors of New York City. I have attended meetings of the following committees of the National Tuberculosis Association: Committee on Medical Research in Philadelphia; on Diagnostic Standards in New York; on Preventoria in New York.

The following papers have been published:

- Tuberculosis Case Finding in Children.
- American Review of Tuberculosis, May, 1927.
- Observations in the Underweight Clinics in Massachusetts.
- Journal American Medical Association, August 27, 1927.
- The Tuberculosis Situation in Massachusetts.
- Boston Medical and Surgical Journal, Sept. 15, 1927.

The paper that I read before the American Sanatorium Association entitled: "X-Ray and Clinical Diagnosis of Tuberculosis in Children" has been accepted for publication in the American Review of Tuberculosis, and the one that I read before the Association of Life Insurance Medical Directors entitled: "The Diagnosis and Prognosis of Juvenile Tuberculosis" is to be published in the Boston Medical and Surgical Journal.

DENTIST'S REPORT.

The following statistics show the work done in the dental clinic during the year: Examinations, 503; Prophylaxis, 331; Extractions, 82; Extractions (Deciduous), 101; Injections, 200; Devitalizations, 4; Root Canal Dressings, 8; Amalgam Restorations, 30; Fillings, 353; Cement Fillings, 336; Sedative Fillings, 115; Gutta Percha, 25; X-Rays, 20; Ethyl Chloride, 18; Treatments, 62; Gold Fillings, 2; Irrigations, 18; Ether, 1. This shows a total of 2,222 operations during the year.

I wish to pay tribute to Dr. Samuel Isserlis whose efficient work as the institution dentist for over two years was interrupted by chronic illness which finally resulted in his death. He was very popular with the patients and employees, and the members of the Medical Staff with whom he was closely associated felt a warm friendship for him. The vacancy caused by his death was filled by Dr. George E. Crowell.

SANATORIUM SCHOOL.

Average Daily Attendance, December, 1926, to December, 1927.

Grade I	22.15
Grade II	22.14
Grade III	16.15
Grade IV	18.33
Grade V	15.19
Grade VI	16.13
Grade VII	22.99
Grade VIII	18.23
Manual Training	16.78
<hr/>	
Total Average	168.09
Total Enrolment	416

IMPROVEMENTS MADE DURING THE YEAR.

Two new 150 H.P. Boilers have been installed and are in use. We now have a well equipped Power Plant which should give us efficient service.

The Administration Building has been painted; the schoolhouse covered with asbestos shingles and quite extensive repairs have been made on several of the other buildings.

A Sprinkler System has been installed in the basements of the Administration and Service Buildings. The fire protection afforded by this installation is of great value to the institution and should be extended to some of the other buildings.

An appropriation of \$4,000 granted for our swimming pool was not large enough to carry out the plans submitted by the Engineering Division, and it was decided to ask for an additional amount before beginning the construction.

An appropriation of \$2,500 was made for improvements to our sewage system but this was inadequate to carry out the necessary changes and work was deferred until an additional appropriation can be obtained.

NEW CONSTRUCTION.

A dormitory for women employees was asked for last year but no appropriation was granted and it is again brought to your attention. It is our greatest need, and proper housing for our employees cannot be furnished until such additional accommodations are provided. We are again asking for an appropriation for this building.

ACKNOWLEDGMENTS.

The resignation of Reverend Robert Keating Smith, as Protestant Chaplain, after many years of service, was accepted with great regret. He was greatly respected as a religious leader, and, in addition, by his frequent visits to the wards, became a personal friend and confidant of the patients regardless of race or creed. His social work was a definite asset to the institution. We are fortunate to have retained the services of the Catholic Chaplain who has faithfully served us for several years.

The employees of the sanatorium deserve commendation for the efficient way the patients are cared for and the other work of the institution is carried on. The employees as a whole are high grade and deserve the recognition that the increased salary schedule gives. I believe because of it we will be able to retain our most efficient employees and build up an even better organization.

Respectfully submitted,

HENRY D. CHADWICK, *Superintendent.*

VALUATION.

Land.

Grounds:		
Lawns and Buildings, 26.8 acres	\$5,235 00	
Woodland, 95.6 acres	4,664 00	
Mowing, 35.6 acres	2,670 00	
Tillage, 30.5 acres	2,187 50	
Orchard, 2.0 acres	400 00	
Pasture, 65.6 acres	1,049 50	
Waste and Miscellaneous, 10.6 acres	680 50	
	<u>\$16,806 50</u>	
Sewerage System	13,742 80	
Total		\$30,629 30

Buildings.

Institution Buildings	\$203,002 29	
Farm, Stable and Grounds	27,170 00	
Miscellaneous	84,310 73	\$314,483 02
Total		<u>\$345,112 32</u>
Present value of all personal property as per Inventory of Nov. 30, 1927		116,084 12
Grand Total		\$461,196 44

POPULATION.

	Males.	Females.	Totals.
Number received during the year	160	161	321
Number passing out of the Institution during the year	158	157	315
Number at end of the fiscal year in the Institution.	153	122	275
Daily average attendance (number of inmates actually present during the year)	130.47	142.55	273.02
Average number of employees and officers during the year	82	46	128

EXPENDITURES.

Current Expenditures:	
1. Salaries and Wages	\$118,956 70
2. Clothing.	4,160 95
3. Subsistence	42,914 78
4. Ordinary Repairs	6,887 30
5. Office, Domestic and Outdoor Expenses	60,452 00
	<u>\$233,371 73</u>
Extraordinary Expenses:	
1. Permanent improvements to equipment and existing buildings	16,969 80
	<u>\$250,341 53</u>

Summary of Current Expenses.

Total expenditure	\$250,341 53	
Deducting extraordinary expenses	16,969 80	\$233,371 73
Deducting amount of sales		3,488 43
		\$229,883 30

Dividing this amount by the daily average number of patients, 273.02, gives a cost for the year of \$842.20, equivalent to an average weekly net cost of \$16.196.

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1926, to Nov. 30, 1927, inclusive.	160	161	321
Number of patients discharged Dec. 1, 1926, to Nov. 30, 1927, inclusive	158	157	315
Number of deaths (including those in previous items)	8	14	22
Number in Sanatorium Dec. 1, 1926	120	149	269
Number remaining Nov. 30, 1927	153	122	275

TABLE 2. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	150	149	299
Married	10	12	22
	160	161	321

TABLE 3. — *Ages of Patients Admitted.*

	Males.	Females.	Totals.
1 to 13 years	100	105	205
14 to 20 years	40	30	70
21 to 30 years	11	18	29
31 to 40 years	5	6	11
41 to 50 years	3	2	5
51 to 60 years	1	—	1
	160	161	321

TABLE 4. — *Nativity and Parentage of Patients Admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	115	42	41	114	38	46	229	80	87
Other N. E. States	9	12	21	12	9	11	21	21	32
Other States	15	16	12	12	20	9	27	36	21
Total Natives	139	70	74	138	67	66	277	137	140
Other Countries:									
Armenia	—	2	1	—	—	—	—	2	1
Australia	1	—	—	—	—	—	1	—	—
Austria	—	3	3	—	4	3	—	7	6
Azore Islands	1	3	3	—	—	—	1	3	3
Bohemia	1	1	1	—	—	—	1	1	1
Canada	8	16	17	12	21	24	20	37	41
Denmark	—	1	1	—	—	—	—	1	1
England	—	1	2	—	4	4	—	5	6
France	—	—	—	—	1	1	—	—	—
Germany	1	1	1	—	3	3	1	4	4
Greece	2	4	4	1	4	3	3	8	7
Ireland	1	10	10	1	5	8	2	15	18
Italy	1	22	20	1	18	17	2	40	37
Lithuania	—	3	3	—	1	1	—	4	4
Norway	—	—	—	1	2	1	1	2	1
Poland	1	7	7	1	11	10	2	18	17
Portugal	—	1	—	—	—	1	—	1	1
Russia	2	4	4	1	5	5	3	9	9
Scotland	—	—	—	2	2	3	2	2	3
Spain	—	—	1	—	1	—	—	1	1
Sweden	—	—	—	1	1	2	1	1	2
Syria	1	1	1	—	—	—	1	1	1
Unknown	20	80	79	21	83	86	41	163	165
	1	10	7	2	11	9	3	21	16
	21	90	86	23	94	95	44	184	181
	139	70	74	138	67	66	277	137	140
	160	160	160	161	161	161	321	321	321

TABLE 5. — *Residence of Patients Admitted.*

Adams, 1	Holyoke, 9	South Hadley, 1
Amherst, 2	Hudson, 3	Somerville, 3
Athol, 1	Housatonic, 1	Southwick, 2
Attleboro, 1	Lenox Dale, 2	Spencer, 1
Belmont, 2	Leominster, 6	Springfield, 63
Boston, 54	Longmeadow, 1	State Minor Wards, 23
Bridgewater, 1	Lowell, 2	Taunton, 2
Brockton, 3	Lynn, 1	Tewksbury, 5
Cambridge, 7	Malden, 1	Uxbridge, 1
Canton, 4	Marlboro, 1	Waltham, 2
Chelsea, 4	Medford, 2	Warwick, 1
Chicopee, 7	Milford, 1	Webster, 3
Clinton, 2	Millis, 1	Wellesley, 3
Deerfield, 2	Montague, 1	Westboro, 2
Dracut, 1	Newburyport, 1	West Brookfield, 1
Easthampton, 1	Newton, 1	Westfield, 2
East Longmeadow, 1	North Adams, 8	West Springfield, 2
Fall River, 1	Northampton, 3	Westminster, 1
Fairhaven, 1	Northbridge, 1	Wilbraham, 1
Fitchburg, 1	Oxford, 1	Winchester, 1
Framingham, 2	Pittsfield, 11	Winthrop, 1
Gardner, 1	Quincy, 4	Worcester, 24
Gilbertville, 1	Randolph, 1	Worthington, 1
Greenfield, 1	Rutland, 2	Total, 321
Holden, 3	Saugus, 5	

TABLE 6. — *Occupation of Cases Admitted.*

	Males.	Females.	Totals.
At Home.	—	3	3
Attendant	—	4	4
Bookkeeper	2	1	3
Bootblack	1	—	1
Candymaker	1	—	1
Cashier	—	1	1
Chauffeur	2	—	2
Clergyman	1	—	1
Clerk	3	2	5
Domestic	1	—	1
Electrician	—	—	—
Factory	9	6	15
Farmer	2	—	2
Housewife	—	10	10
Laundryman	1	—	1
Meat Cutter	1	—	1
Mechanic	3	—	3
Merchant	1	—	1
Messenger	3	—	3
Musician	1	—	1
Osteopath	—	1	1
Painter	1	—	1
Plumber	1	—	1
School	125	126	251
Stenographer	—	2	2
School Teacher	—	2	2
Waiter	1	—	1
	160	161	321

TABLE 7. — *Stage of Disease on Admission.*

	Males.	Females.	Totals.	Percentages.
Non-tuberculous	1	6	7	2.18
No Disease	9	7	16	4.98
Malnutrition	12	18	30	9.36
Adenitis	—	1	1	.31
Cervical Adenitis	—	3	3	.93
Hilum Tuberculosis	80	68	148	46.1
Minimal	19	14	33	10.29
Moderately Advanced	20	22	42	13.09
Advanced	12	19	31	9.68
Pulmonary Abscess	1	1	2	.62
Bronchial Asthma	1	—	1	.31
Pott's Disease	2	—	2	.62
Empyema	1	—	1	.31
Bronchiectasis	1	1	2	.62
Chronic Endocarditis	1	—	1	.31
Unclassified	—	1	1	.31
	160	161	321	100.00

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentages.
Apparently Well	25	32	57	18.09
Apparently Arrested	67	71	138	43.8
Improved	42	26	68	21.59
Unimproved	10	6	16	5.08
Not Considered	6	8	14	4.45
Died	8	14	22	6.99
	158	157	315	100.00

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month.	—	—	—	—	—	—
1 to 2 months	—	—	—	—	2	2
2 to 3 months	—	—	—	1	—	1
3 to 4 months	—	—	—	—	1	1
4 to 5 months	—	—	—	—	3	3
5 to 6 months	—	—	—	2	1	3
6 to 7 months	1	—	1	1	—	1
7 to 8 months	—	1	1	—	1	1
8 to 9 months	—	—	—	—	—	—
9 to 10 months	—	2	2	—	—	—
10 to 12 months	—	1	1	—	2	2
12 to 18 months	3	6	9	1	2	3
18 to 24 months	2	2	4	2	1	3
Over 2 years	2	2	4	1	1	2
	8	14	22	8	14	22

TABLE 10. — *Causes of Death.*

CAUSE.	Males.	Females.	Totals.
Pulmonary Tuberculosis	7	14	21
Acute Miliary Tuberculosis	1	—	1
	8	14	22

PONDVILLE HOSPITAL.

RESIDENT OFFICERS.

LYMAN A. JONES, M.D., *Superintendent.*
 JOHN F. KELLOGG, JR., M.D., *Senior Physician.*
 ABRAHAM KAPLAN, M.D., *Asst. Physician.*
 MARION MACKENZIE, *Senior Bookkeeper and Treasurer.*
 VERONICA M. BEAUREGARD, *Superintendent of Nurses.*
 MAY E. DONOVAN, *Head Housekeeper.*
 CESARE SCAGLIARINI, *Steward.*
 ERNEST L. GAGE, *Chief Engineer.*
 DANIEL DONOVAN, *Groundskeeper.*

NON-RESIDENT OFFICERS.

ERNEST M. DALAND, M.D., *Chief of Visiting Staff.*
 ISAAC GERBER, M.D., *Senior Physician, Visiting Radiologist.*
 JAMES C. HUDSON, *Physicist.*
 ROGER GRAVES, M.D., *Senior Physician, Urologist.*
 HENRY JACKSON, M.D., *Senior Physician, Internist.*
 JOE VINCENT MEIGS, M.D., *Senior Physician, Gynecologist.*
 CROSBY GREENE, M.D., *Senior Physician, Nose and Throat Specialist.*
 ARTHUR M. GREENWOOD, M.D., *Senior Physician, Skin Specialist.*
 RICHARD H. NORTON, D.M.D., *Senior Physician, Oral Surgeon.*
 HOMER WRIGHT, M.D., *Senior Physician, Pathologist.*

To DR. GEORGE H. BIGELOW, *Commissioner, Department of Public Health.*

I have the honor to submit the first annual report of the Pondville Hospital (Norfolk), P. O. Wrentham, Mass., for the year ending Nov. 30, 1927.

The hospital was formally opened on June 21, 1927, with His Excellency Alvan T. Fuller, Governor of Massachusetts, in attendance. An account of the exercises

already has appeared in print (Boston Medical and Surgical Journal, Vol. 197, No. 14, pp. 551-561, Oct. 6, 1927).

During the year, \$81,529.22 were expended for maintenance. There has been collected from miscellaneous sources, \$3,099.28 (total of all collections). There has been collected from private sources \$2,032.00, from cities and towns \$677.50, and from sales \$389.78.

Sixty-three patients were supported by private funds, cities and towns were responsible for 30, while 16 were supported by the State, leaving two patients (an employee and an accident case) for whom no charge was made.

There has been expended from the special appropriation authorized by Chapter 328, Acts of 1927 (Purchase of Radium \$70,000), \$69,880.30. From \$10,000 annual appropriation for the care of radium, authorized by Chapter 328, Acts of 1927, there has been expended \$3,664.21.

From the opening to November 30 inclusive, 123 patients were admitted. Of these, 12 represented readmissions. Forty patients remained at the close of the year.

Patients were received from 60 cities and towns and from three other state institutions.

Patients were discharged to the number of 83, of whom 46 were improved, 20 were not improved, while 17 died.

The average duration of stay in the hospital was 30.3 days. The smallest number on any one day was 7, the largest was 44.

The average number of patients in the hospital daily was 23.2.

Since the facilities of the hospital are limited to the treatment of cancer cases, it is not remarkable that with few exceptions patients treated were 40 years of age and over, with the large majority 50 years of age and over.

Out-patient Clinic. — Since July 9, 1927, a weekly clinic has been held at the Hospital. Sixty-five patients presented themselves at the clinics and were examined and advised by the members of the staff. Of these, 25 were subsequently admitted to the Hospital as house patients. Twenty such clinics have been conducted.

Laboratory Report. — The work done in the Laboratory comprised the following: Urine examinations, 168; Blood counts, 73; Blood sugar, 2; Blood grouping, 4. Non-protein nitrogen determination, 1. Wassermann specimens taken, 73, of which 2 were positive. Kahn tests taken, 2, both positive.

X-Ray and Radium. — Diagnostic X-Ray Plates taken, 147; Fluoroscopic examinations, 11; X-Ray treatments given, 200; Radium treatments, 101.

Operations. — Under ether, 20; Under gas oxygen, 10; Under local anesthesia, 14. Total, 44. Gas oxygen for radium treatment, 2.

Changes in Personnel. — Since the opening of the hospital, in addition to Dr. Kaplan, now serving as Assistant Physician, the following served temporarily in a similar capacity:

Dr. Charles Knowles
Dr. Neil J. MacMurchy
Dr. F. H. MacCarthy

On October 1, Miss Elizabeth Ross, Superintendent of Nurses since the opening of the hospital, resigned to accept an administrative position elsewhere. Miss Ross's wide experience in executive and other forms of nursing work were of great value in setting up and establishing the nursing service of the hospital. Her assistant, Miss Veronica M. Beauregard, was promoted to fill the vacancy.

Mr. Charles J. Odenweller, steward, resigned on July 30, and Mr. Cesare M. Scagliarini was appointed as his successor.

Whatever of success has attended the administrative development of the hospital since its opening is in no small degree the result of the almost universal loyalty and willing co-operation of officers and employees. In this connection, it is a pleasure to acknowledge the co-operation and assistance freely rendered at all times by the members of the visiting staff, as well as the assistance and advice given by other members of the Department and by the Department of Administration and Finance.

Recommendations. — For the coming year, funds have been requested to provide for a gardener and a garden, to furnish fresh vegetables in season; and for a baker, so that the hospital may provide its own baker's products.

Additional refrigeration is urgently needed to provide storage facilities now lacking.

Funds also have been requested for needed work on roads and walks.

Respectfully submitted,

LYMAN A. JONES, M.D.,
Superintendent.

POPULATION.

	Males.	Females.	Totals.
Number admitted during year	61	62	123
Number discharged during year	42	41	83
Number remaining at end of year	19	21	40
Daily average attendance (number of inmates actually present during year)	11.84	11.60	23.24
Average number of officers and employees during the year	—	—	63.85

STATISTICAL TABLES.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Hospital, Dec. 1, 1926.	—	—	—
Patients admitted from Dec. 1, 1926, to Nov. 30, 1927, inclusive	61	62	123
Patients discharged from Dec. 1, 1926, to Nov. 30, 1927, inclusive	42	41	83
Patients remaining in Hospital, Nov. 30, 1927	19	21	40
Daily average number patients	11.84	11.6	23.24
Deaths (included in number discharged)	10	7	17

TABLE 2. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	14	10	24
Married	29	30	59
Widowed	9	15	24
Divorced	1	—	1
Separated	—	3	3

TABLE 3. — *Age of Patients Admitted.*

	Males.	Females.	Totals.
20 to 29 years	1	4	5
30 to 39 years	—	4	4
40 to 49 years	7	15	22
50 to 59 years	24	17	41
60 to 69 years	18	17	35
70 to 79 years	9	5	14
80 to 89 years	2	—	2
	61	62	123

TABLE 4. — *Nativity of Patients Admitted.*

PLACE OF NATIVITY.	Males.	Females.	Totals.
United States	33	32	65
Other Countries:			
Bohemia	1	—	1
Canada	5	5	10
England	1	6	7
France	1	—	1
Ireland	7	7	14
Italy	2	1	3
Lithuania	—	1	1
Russia	—	2	2
Poland	—	1	1
Scotland	1	2	3
Sweden	1	1	2
Unknown	1	—	1

TABLE 5. — *Residence of Patients Admitted.*

Ashland, 1	Canton, 1	Gloucester, 1
Athol, 1	Chicopee, 1	Greenfield, 1
Attleboro, 1	Dedham, 1	Groveland, 1
Belmont, 1	East Bridgewater, 1	Hanson, 1
Beverly, 1	Fall River, 1	Haverhill, 2
Billerica, 2	Falmouth, 1	Hull, 2
Boston, 18	Foxboro, 2	Lawrence, 1
Braintree, 3	Franklin, 3	Littleton, 1
Brockton, 4	Freetown, 1	Lowell, 1
Brookline, 1	Gardner, 2	Lynn, 7

TABLE. — *Residence of Patients Admitted.* — Concluded.

Marion, 1	Pembroke, 3	Taunton, 1
Medford, 2	Plymouth, 1	Walpole, 4
Milford, 2	Rehoboth, 1	Westfield, 4
Millis, 2	Revere, 1	Westford, 1
Middleboro, 1	Rockland, 1	Weymouth, 1
Nahant, 1	Salem, 2	Woburn, 3
New Bedford, 1	Saugus, 1	Worcester, 3
Newton, 2	Sharon, 1	Boston State Hospital, 1
Norfolk, 2	Somerville, 2	State Infirmary, 4
No. Attleboro, 1	Springfield, 1	State Farm, 2
Norwood, 3	Sterling, 1	Total, 123
	Sutton, 1	

TABLE 6. — *Occupation of Patients Admitted.*

	Males.	Females.		Males.	Females.
Auto mechanic	1	—	Lumberman	1	—
Attendant nurse	—	2	Mill worker	1	—
Baker	1	—	Millwright	2	—
Blacksmith	1	—	Packer	1	—
Bookkeeper	1	—	Painter	4	—
Brakeliner	1	—	Papermill worker	1	—
Carpenter	3	—	Peddler	1	—
Chambermaid	—	1	Plumber	1	—
Clerk	3	1	Retired	3	—
Cook	—	1	Rubber worker	1	—
Electrician	1	—	Sawyer	1	—
Engineer	1	—	Sexton	1	—
Factory worker	1	—	Shoe operator	4	2
Fisherman	1	—	Steamfitter	1	—
Farmer	2	—	Stonemason	2	—
Foundryman	1	—	Truckman	1	—
Housekeeper	—	2	Waitress	—	2
Housewife	—	34	Watchman	1	—
Housework	—	3	Woodworker	2	—
Janitor	1	—	No occupation	2	4
Laborer	6	1			
Laundress	—	2		56	55

Total number of occupations, 41.

TABLE 7. — *Stage of Disease in Patients Admitted.*

	Males.	Females.	Totals.
Precancerous	—	1	1
Early	1	1	2
Moderately advanced	7	6	13
Advanced	43	41	84
Not cancer	4	3	7
No diagnosis	2	2	4

TABLE 8. — *Patients Admitted — Organs Involved.*

	Males.	Females.	Totals.		Males.	Females.	Totals.
Antrum	1	—	1	No Diagnosis	2	3	5
Bladder	1	1	2	Neck	1	—	1
Buccal Mucosa	7	1	8	Nose	2	—	2
Breast	—	10	10	Œsophagus	1	—	1
Carcinomatosis	—	1	1	Ovary	—	2	2
Cervical Glands	1	—	1	Pancreas	—	1	1
Cervix Uteri	—	12	12	Penis	2	—	2
Colon	1	1	2	Pharynx	1	1	2
Ear	2	—	2	Prostate	1	—	1
Frontal Sinus	1	—	1	Rectum	4	4	8
Glands	—	1	1	Stomach	3	4	7
Jaw	1	1	2	Tongue	6	—	6
Larynx	4	—	4	Uterus	—	8	8
Lip	6	—	6	Vagina	—	3	3
Malignant Lymphoma	1	—	1	Vulva	—	1	1
Not Cancer	4	5	9				

REPORT OF THE CANCER SECTION.

The Cancer Section comprises the following activities: administration of admissions to the Pondville Hospital at Norfolk; assistance in the establishment and supervision of the cancer clinics; furtherance of the cancer educational projects; and direction of statistical research on cancer.

1. PONDVILLE ADMISSIONS.

The following table shows the disposition of all applications to the Pondville Hospital from June 21, 1927, to January 1, 1928:

	Males.	Females.	Totals.
Number of Applications	113	102	215
Number of Admissions	84	84	168
Number Not Admitted	29	18	47

This table shows the disposition of the patients not admitted to the Pondville Hospital: — Reasons for Not Being Admitted: died before admission, 19; rejected as non-residents, 3; too ill to go, 3; went to other hospital, 9; did not wish to go, 7; other arrangements, 2; cases pending, 4. Total, 47.

The next table shows the average population per day at the Pondville Hospital, by months:

June (8 days)	8.6	October	23.9
July	21.4	November	35.5
August	17.9	December.	48.8
September	13.7		

Average for the total days, 26.0.

2. STATE-AIDED CANCER CLINICS.

Cancer clinics were opened in Newton on December 17, 1926; Worcester on February 9, 1927; Springfield on March 4, 1927; Lynn on April 22, 1927; Lowell on May 27, 1927, and Pondville on June 21, 1927. Plans are now under way for the opening of other clinics in the near future in Leominster, Gardner, Fitchburg, Pittsfield, North Adams, Great Barrington, Holyoke, Lawrence, Brockton and New Bedford. At these clinics diagnostic service is available for everyone.

The following tables show the experience of the clinics to January 1, 1928:

	Males.	Females.	Totals.
Attendance	418	942	1360
Per Cent with Cancer	33.5	18.5	23.1
Per Cent of Cancer Cases in Operable Stage	65.0	71.8	68.8
Median Age of Cancer Patients	62.4	58.5	60.0
Median Age of Non-Cancer Patients	47.4	45.4	46.0

	Newspapers.	Physicians.	Others.
Reason for Coming to Clinic:			
All Clinic Patients	61.6%	20.1%	18.3%
Cancer Cases	39.0%	44.8%	16.2%
Operable Cancer Cases	45.4%	42.6%	12.0%

	One Physician.	More Than One Physician.	No Physician.	Not Stated.
Contact of Cancer Patient with Physician before Coming to Clinic	43.3%	33.1%	14.0%	9.5%

Types of Cancer:			
Buccal Cavity	22.6%	Male Genital Organs	1.6%
Stomach, Liver Group	2.5%	Breast	19.1%
Peritoneum, Intestine, Rectum Group	4.8%	Cancer Unspecified	3.8%
Skin	30.2%	Cancer of Other Organs	1.6%
Female Genitals	13.4%	Not Stated	.3%

Symptoms Which Brought Patient to Clinic:			
Swelling	36.8%	Ulceration	9.0%
Pain	44.8%	Deformity	2.8%
Loss of Weight	8.2%	Malaise	4.1%
Discharge	13.9%	Scaly Skin	1.7%
Bleeding	.7%	Itching	.7%
Unknown and Others	7.1%		

Those individuals who reported pain as a symptom were divided into operable cancer, inoperable cancer and non-cancer. Twenty-five per cent of the operable

cancers complained of pain, fifty per cent of the inoperable cancers complained of pain and forty-eight per cent of the non-cancers complained of pain. Early cancers, therefore, have less pain than the other clinic cases.

The median interval between first symptom and first visit to a physician for cancer patients is 7.4 months and for non-cancer it is 10.7 months. The median interval between first symptom and first visit to clinic for cancer patients is 11.6 months and for non-cancer patients is two years.

These intervals for the cancer patients have been sub-divided by type of cancer in the following table:

TYPE OF CANCER.	MONTHS BEFORE VISITING PHYSICIAN.		MONTHS BEFORE VISITING CLINIC.	
	Males.	Females.	Males.	Females.
Buccal Cavity	5.5	10.0	10.4	over 2 years
Stomach Group	4.0	0.8	20.0	9.0
Intestinal Group	4.5	5.0	10.0	9.0
Female Genitals	—	2.3	—	6.9
Breast	0.8	8.5	0.8	18.3
Skin	10.7	13.0	18.0	over 2 years
Male Genitals	8.3	—	8.3	—
Other Organs	9.0	.7	over 2 years	2.6
Unspecified	19.5	10.0	over 2 years	20.0

Patients have attended the State-aided cancer clinics from one hundred and thirty-one cities and towns in Massachusetts. The places from which ten or more patients came are as follows: Boston, 10; Chicopee, 13; Dracut, 12; Holyoke, 14; Lowell, 386; Lynn, 188; Newton, 14; Saugus, 16; Southbridge, 13; Springfield, 140; Tewksbury, 11; Swampscott, 13; Worcester, 247.

3. EDUCATION.

The Cancer Section has endeavored to bring to the greatest possible number of people a few facts about early cancer, to summarize:

1. Six radio talks have been broadcasted.
2. Publicity has been sought through the newspapers and various bulletins of state-wide organizations with the result that our files contain 6,857 inches of space collected from papers from various parts of the State. Probably this represents less than 20 per cent of the total volume.
3. Literature written by members of the section, as well as that procured from the American Society for the Control of Cancer, has been distributed. Approximately 78,000 pamphlets have been given out.
4. Lantern slides and a moving picture film have been shown in various parts of the State.
5. Thirty-four nursing groups have been addressed with a total attendance of 4,279. The Section maintains a speakers' bureau of persons eminent in the cancer field.

4. STUDIES.

Various studies are being conducted in a search for more light on cancer, in brief:

1. *Study of the Death Records:* These studies have already contributed to the cancer literature, the most important contribution being a paper which was published in the October issue of the Proceedings of the National Academy of Science.
2. *Newton Morbidity Reporting Area:* The physicians of Newton have voluntarily agreed to report their cancer cases.
3. *Nurses' Questionnaires:* The leading visiting nurse associations have been filling out questionnaires for cancer cases and controls. These questionnaires cover the habits of cancer patients and their controls, making it possible to detect any differences which may exist between these two groups.
4. *Massachusetts General Hospital Study:* The Social Service Department of the Massachusetts General Hospital is co-operating with the State Department of Public Health in making the study of the relationship between nationality and cancer. This work has been in progress for about nine months.
5. *Winchester Survey:* In Winchester a house-to-house survey was made in an attempt to learn the volume of chronic diseases, including cancer, as well as the acute illnesses in a community.

7. *Boston Dispensary Study*: The nationality of all patients, for all diseases, is being studied.

Estimated population	4,269,283
Death rate per 1,000 population	11.6
Infant mortality	64.6
	per 1,000 live births

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J.C. Knox

The Commonwealth of Massachusetts

ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH

FOR THE

YEAR ENDED NOVEMBER 30, 1928



FOURTEENTH ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH OF MASSACHUSETTS

REPORT OF THE PUBLIC HEALTH COUNCIL.

At the end of the fiscal year closing November 30, 1928, the State Department of Public Health was constituted as follows:

Commissioner of Public Health GEORGE H. BIGELOW, M.D.

PUBLIC HEALTH COUNCIL.

GORDON HUTCHINS, 1931.

SYLVESTER E. RYAN, M.D., 1931.

FRANCIS H. LALLY, M.D., 1930.

RICHARD P. STRONG, M.D., 1929.

ROGER I. LEE, M.D., 1930.

JAMES L. TIGHE, B.A.Sc., C.E., 1929.

During the year twelve formal meetings of the Department were held, as well as meetings of the standing committees.

The Committee on Sanitary Engineering, composed of Mr. Tighe, Mr. Hutchins and Dr. Bigelow, has met prior to the Public Health Council, as is customary, and has considered in detail all matters coming before the Department having to do with water supplies, sewage disposal and sanitation generally, subsequently submitting recommendations thereon to the Public Health Council.

The practice has been continued of having two of the meetings of the Council held in rotation at the five institutions under the direction of the Department. This year these were held at the Lakeville and Rutland State Sanatoria. The institutions were inspected, the problems and needs discussed, and the quality of service given was demonstrated. Also, the Council visited the Metropolitan sewer outlets in Boston Harbor, certain areas in Quincy Bay, Savin Hill Bay and Fort Point Channel, areas which under legislative resolves the Department was studying, and attended the opening meeting of the Cancer Campaign at Symphony Hall at which His Excellency the Governor and others spoke.

As provided by statute, the Department has held public hearings on plans for sewage disposal, taking of lands for the protection of public water supplies and the dismissal of certain employees. The Public Health Council has considered and approved appointments submitted by the Commissioner as required by law, and has also considered and advised relative to various matters of policy and administration connected with the Department.

Chapter 12 of the Resolves of 1928 directed the Department to investigate the pollution of the waters of Quincy Bay. This study has been made and a report submitted.

Chapter 9 of the Resolves of 1928 directed the Department to study the pollution of the waters of the Saugus River and its tributaries. This study has been made and a report submitted.

Chapter 26 of the Resolves of 1928 directed that the Department investigate the sanitary condition of the Merrimack River. This study has been made and a report submitted.

Also chapters 39 and 23 of the Resolves of 1928 designated the Commissioner as a member of special commissions to investigate unsanitary conditions in and about that part of Dorchester Bay known as Savin Hill Bay, and to investigate the filling of the navigable waters of Fort Point Channel and South Bay, respectively. These two commissions have made their studies and submitted reports.

At a meeting of the Department on January 15, 1929, the Commissioner of Public Health presented to the Council a report of the activities of the Department for the fiscal year 1928, and it was voted that this report, together with the foregoing brief summary of the doings of the Public Health Council, be approved and adopted as the report of the State Department of Public Health for the year 1928.

FOURTEENTH ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC HEALTH.

To the Public Health Council:

GENTLEMEN: — I have the honor to submit herewith my annual report for the fiscal year ending November 30, 1928.

There are certain matters in connection with disease prevalence and public health practice which seem worthy of especial attention: Raw milk is known to have sickened about one thousand persons and killed forty-eight with septic sore throat, as well as causing minor outbreaks of scarlet fever, typhoid fever and an acute gastro-intestinal outbreak of unknown etiology; the supervision of pasteurizing plants by the Department in the past year and a half has shown unprecedented accomplishments in improved equipment and in the general support of dealers; the cooperative cancer campaign put on for five days last spring on a state wide basis, in which all dignified methods of propagandizing the public and the medical profession were used, accomplished astonishing quantitative results, but as is usual in such matters, the vastly more important qualitative results must be left to the future or the more courageous to estimate; in typhoid fever we may again report a lower death rate (0.83 deaths per 100,000 — all disease figures will, as formerly, be given for the calendar rather than the fiscal year) than has ever been reported by this or any other state, excepting possibly Minnesota, that four food handlers have been "cured" of their carrier state, and that the Legislature has given authority to enforce examinations of suspected professional food handlers; the hideously unnecessary disease, rabies, has killed four humans, and reached an unprecedented figure among dogs in the eastern part of the state, as has organized indifference to its control among unrestrained citizens; smallpox is somewhat increasing in this and neighboring states, with the result that in the affected localities a wholesome respect for vaccination develops over night and there is much inconvenience to multiple wide flung contacts; two studies of diphtheria deaths show that in general three-quarters are due to parental and one-quarter to medical neglect; just now the newspapers and the advertisers of proprietary preparations may be successful in inaugurating an "influenza epidemic" (there would seem to be little cause for alarm as long as our pneumonia deaths remain around those expected for this time of year, although there is apparently no doubt that acute respiratory disease is more prevalent than "normal"); under the Department's ten year program against juvenile tuberculosis an increasing number of examinations are being made annually, and from the re-examinations it is apparent that since only slightly more than half the children show improvement more effective cooperation from the local communities must be obtained if tuberculosis is in this way to be dragged down from its place as the principal cause of death in the age group fifteen to thirty-nine as it was in 1927; more effective county hospitalization of adult tuberculosis is promised through the acceptance of the act allowing building in Middlesex and Worcester Counties, and through the contemplated addition in Essex, but the Connecticut Valley and Berkshire Counties are still far below any reasonable standard in this regard and show little evidence of appreciating it; municipal purification of clams through chlorination is being tried in Newburyport, and although not without its complications, gives promise of a dependable method of safely putting on the market an otherwise dangerous food product; and finally, and perhaps in the long run most significantly, through health surveys and personal contacts of members of our staff and others there is growing in certain of the smaller communities an interest in union health districts which we hope the Legislature will this year legalize, to the end that as in the school superintendency districts, pooling of resources may make it possible for the rural towns to obtain competent full time health service. These points and others will be elaborated in this report and in those of the Division Directors which follow.

I. COMMUNICABLE DISEASES.

This calendar year there were 103,573 cases of communicable disease reported as compared with 83,816 in 1927, or an increase of 23 per cent. This increase

was largely contributed by the 28,000 more cases of measles reported this year. Some of the other diseases showing an increase were pneumonia (although the deaths showed a slight decrease), septic sore throat, smallpox and rabies. A decrease was recorded in scarlet fever, anterior poliomyelitis, diphtheria and typhoid. In many of these the fluctuation was slight and does not indicate a trend.

Communicable Disease Practice. — Supplementing our activity, recorded last year, of encouraging more widespread adoption of the Standard Minimum Quarantine Requirements (adopted in 61 out of 355 cities and towns), in selected areas surveys of the public health resources, both public and private, have been made. Through these and other means outside the Department interest in union health districts is being developed. The former Commissioner, Dr. Eugene R. Kelley, said five years ago that the outstanding administrative public health problem of Massachusetts was how could modern adequate full time service be made available to the rural towns of Massachusetts without running counter to our theory of government and preserving our highly developed local self-consciousness in these matters. Barnstable County, like the western and southern parts of this country, has successfully solved it by setting up under special legislation a full time county health service. But just as Cape Cod would be the first to claim that organizations suitable for the rest of the state are not necessarily applicable to it, so the Barnstable County organization could possibly serve as a model only for the few other very rural counties. Elsewhere a grouping of towns in a health district, similar to the successful school superintendency districts, would seem to give what Dr. Kelley had in mind. Here a group of towns representing a population of about 20,000 for a per capita expenditure of around fifty cents could employ a full time health officer and subordinate staff in some instances at less cost than at present and get results. The members of many boards of health at present vie with the babes in the wood in their ingenuous starry eyed wonder in wandering through the tangle of the preventive science, mistaking such parasites as terminal fumigation for such soundly rooted well nourished practices as active immunization.

Professor C. E. Hilliard, a notable member of the Board of Health of Wellesley, is distressed at the prospect of the disintegration of the Wellesley Cooperative Board which was so notably started some fifteen years ago by the late Professor Sedgwick and Professor Phelps, so he is introducing legislation legalizing union health districts. The distinctive feature of this bill is that it creates a board representing the cooperating communities to which the health officer is responsible and which can work out programs on a district basis. The early Barnstable and Wellesley cooperative endeavors lacked such centralized direction. The health officer alone knew the whole field of his responsibility, and such administrative isolation is incompatible with continued official sanity. As this bill is optional, not mandatory, its only objectors would seem to be the present part time incompetent local inspectional group. The competent can be kept at better full time salaries under the district plan. But the more useless the leaf, the more tenaciously it hangs to the twig!

Outbreaks. — Twenty-two "outbreaks" of communicable disease have been recognized by the Department. How many have not been so recognized and what constitutes an "outbreak" are matters that might be discussed at great length. These outbreaks accounted for at least 1,950 cases of disease with 79 deaths, and were distributed as follows: Eight acute gastro intestinal of undiscovered etiology, 4 scarlet fever, 4 diphtheria, 2 each typhoid fever and smallpox, and 1 each septic sore throat, dysentery (Flexner) and trichinosis. Twenty per cent (4) of the outbreaks were spread by raw milk and accounted for at least 1,000 of the cases and 48 (60 per cent) of the deaths.

Septic Sore Throat. — For the first time in fifteen years a devastating epidemic of septic sore throat occurred in Massachusetts in July. In Lee some 1,000 persons (only 149 were ever reported) were sick and 48 died. Approximately 93 per cent of the cases occurred in individuals whose raw milk supply either regularly or occasionally was a raw milk obtained from a herd where a cow was found to be grossly infected with a haemolytic streptococcus morphologically and culturally identical with that causing the earlier devastating epidemics in Boston, Balti-

more and Chicago. The infected quarters gave forth a product grossly similar to advanced tuberculous sputum and yet veterinarians and agriculturists on inspection could not identify which quarters were infected. Still we hear that inspection alone will make a milk supply safe! The epidemic was promptly stopped by pasteurization. About 90 per cent of the cases were under 60, while 60 per cent of the deaths were in the age group over 60, largely in persons with pre-existing pathology. Detailed reports on the clinical, epidemiological and bacteriological aspects of the epidemic will be reported in the professional journals when the enormous amount of material is finally assembled.

To the community which during the climactic week was scarcely able to bury its dead, His Excellency, the Governor offered the resources of the state. A milk inspection demonstration has been organized at the expense of the state by this Department in Berkshire County. Although occasionally (which was not possible in Sodom) an interested official or citizen has been found, in general a pall of indifference has descended on the afflicted area, broken here and there by those who in the name of raw milk are actively opposed to the demonstration which is aimed, if anything can, to make raw milk safe. Whether or not from all this the general quality and safety of Berkshire produced milk will be improved is hanging in the balance and at present it looks much as if these dead would have died in vain.

Typhoid Fever.—With 36 deaths this year Massachusetts boasts a typhoid death rate of 0.83 per 100,000 population. Although individual cities have bettered this figure no state, with the possible exception of Minnesota, has ever done so. The principal menaces against continuing this astonishing record are: (1) Contact through food with carriers, who are still being produced in wholesale lots by such epidemics as Montreal had in 1926 and Olean, N. Y., is just recovering from; (2) raw milk; and (3) treated water where crucial responsibility is placed in the hands of incompetent, underpaid, or indifferent personnel, in the name of economy or worse. The rest of the country tends to look slightly at us for our faith in raw water. It is admitted that the local raw supply with limited storage has little or no margin of safety. There are a number of these in this state, supervision of which we must not neglect through pressure of more dramatic matters. But the large supply with months or years of storage, with more or less adequately controlled watersheds and frequent analyses, we must insist is not surpassed by any method of treatment of a non-potable water yet devised. In support of this position we point to our typhoid death rate.

Four typhoid carriers have been "cured" in the opinion of the Department following removal of the gall bladder. Three of these were professional food handlers and were operated on at the state's expense. The "cure" was pronounced only after a year of cultural observation and final negative diarrheal and duodenal specimens. No operation is recommended until a positive duodenal specimen has been obtained. Submission to operation is of course voluntary. This would seem to give us a technique for handling adequately the typhoid carrier who has constituted such a baffling problem to the health administrator, and as such, was second only to the source of venereal infection.

This year the Legislature gave us authority to force examination of professional food handlers suspected of having, or being carriers of, communicable disease (chapter 229, Acts of 1928). Although occasionally it will be wholesome to enforce this authority, it will be of greatest value as a potential rather than an actual weapon. The health officer who depends principally on law enforcement for results is still using the weapons of the stone age to fight the modern battle against disease. Perhaps environment can be fairly effectively controlled by law, but not individuals! The iconoclast would take satisfaction in knowing that the first instance in which we felt that we might have to utilize our new authority to demand specimens for laboratory examination was in a person not a professional food handler and therefore not covered by the act!

Rabies.—Following the medical inadequacies demonstrated in our fourth human death from rabies, the Department ruled that all dog bites in humans should be reported, rather than only those which in the opinion of the physician needed the Pasteur protective inoculations, this to continue at least during the

present prevalence. In the eastern part of the state these two groups should be synonymous unless the dog can be observed for ten days. From our experience during the last three months under the new regulation and with the extension of the disease westward in the state, over 4,000 persons will be reported in 1929. This will probably represent less than half the bitten. At a minimum figure of \$50 for the prophylactic material and its administration, over a quarter of a million dollars will be spent by boards of health and private individuals. To this should be added the discomfort of the fourteen or more inoculations in the abdomen, the apprehension during the possible twelve month incubation period and the rare human death.

Last winter this Department and the Division of Animal Industry of the Department of Conservation attempted to develop effective elimination of the stray dog (the vector of rabies in this state) through cooperative restraint of owned dogs in the seventy communities composing the Metropolitan area. It was a colossal failure penalizing only those stupid enough to cooperate in our endeavor to protect them and their beloved dogs from this quite hideous disease. The failure was directly due to the efforts of that most dangerous element in democracy, the sentimentalists. One wonders were an equally effective prophylactic measure known against infantile paralysis or influenza, how long the public would stomach those who mouthed opposition to its effective enforcement.

Smallpox. — There have been 19 cases of smallpox in Massachusetts this year, the largest number since 1921. Of the 19, fourteen had never been successfully vaccinated, while five had not been so vaccinated within seven years, the period during which the Detroit experience shows absolute protection persists. Connecticut and Maine have an increase in cases. Thus New England contributes in a small way to another monument of sentimentality which allows the United States with 40,000 cases last year to be surpassed only by India in its volume of smallpox. Meanwhile the New Hampshire courts order that the fine be worked off at fifty cents a day in jail by the "conscientious objector", who has as much excuse for his tenets as he would to parade the streets naked to prove that in a republic he is a free independent agent. In the desert island, yes, the monkeys are used to it! In the market place, no, other bodies as well as souls must be considered! May the Legislature this year see fit to extend compulsion to the private school, and do away with the parasitic protection which it is possible for private school pupils to obtain at present, since the public school pupils form around them a sanitary cordon of immune individuals.

Measles. — This has been a measles year with 41,519 cases, or an increase of some 28,000 cases over last year. Of these 265 died. In the last twenty years measles has come from the sixteenth to the tenth place among killing diseases under one year of age, and in the age group one to four it has risen from the eleventh to the fourth place. Quarantine has proved futile in general control since most of the spread is accomplished before the disease is recognized and quarantine instituted. This demonstrates that every effort must be made to protect the pre-school child from the disease brought in from the school or elsewhere, and we must not let this age group "get it over with" when the older ones have it. Also it emphasizes the fact that physicians should make more general use of convalescent or parent blood in immunizing pre-school children who are exposed. Finally, since it is the complicating pneumonia which generally kills, it shows the need of keeping the early febrile case in bed to avoid chilling.

Scarlet Fever. — This year scarlet fever, which in a mild form has covered the state of late, showed one-third less cases (10,473 as compared with 16,546 in 1927). Our resources against this disease have been enormously enhanced by the development of an antitoxin fully as effective in treatment as is that for diphtheria. This serum is now available free to all physicians in the state. Soon a method of active immunization against this disease will probably be established as is that against diphtheria. When that time comes we must be able to further it effectively, based on knowledge. To this end our Statistical Consultant, Dr. Carl R. Doering, has studied the history, incidence, fatality and mortality of the disease in Massachusetts since 1849. A summary of this study will be given elsewhere in this report and the entire work will appear in one of the professional journals.

Diphtheria. — Two studies of diphtheria deaths in Massachusetts¹ for 1926 and 1927, respectively have been published this year by Dr. Lane. In general they show that three-quarters of the deaths are due to parental and one-quarter to medical neglect. Dr. Lane is also collecting an enormous amount of current and historical data on this disease which should be ready for publication this year. This, if anything can, should furnish factual data on which the effectiveness of diphtheria immunization in favorably influencing the prevalence of the disease in large population groups may be established. The individual value of its application has been so established.

Lane finds records of about a quarter of a million children immunized from 1921 through 1927. This has been done, except in private practice, almost exclusively in the grade schools to children six to eleven years of age. Since in this seven year interval there have been nearly one million children in this age group, not more than 25 per cent according to available records have been immunized.

The effectiveness of the three inoculation method is shown by the fact that over 9,000 children in and about Boston given the Schick test six months or more after inoculation show 85 per cent immune, while 1,500 in the Connecticut Valley show 86 per cent immune. Our laboratory is putting out, therefore, an excellent product.

Evidently this work must be pushed since diphtheria vies with accidents as the principal cause of death in the age group five to nine, and it must be extended to the pre-school child who is administratively much harder to reach, for here, although diphtheria falls to the fifth place as a cause of death, the total number of fatalities is greater than in the age group five to nine.

Anterior Poliomyelitis (Infantile Paralysis). — This year there were 434 cases reported as compared with 1,189, in 1927. The incidence was exceptionally high in Watertown and Waltham, where in quite a striking proportion of cases, contact could be traced. Dr. Eliot H. Luther, serving both on our staff and that of the Harvard Infantile Paralysis Commission, saw 334 cases in consultation, of which 178 were anterior poliomyelitis. Our laboratory processed the considerable amount of convalescent serum handled by the Commission, and we further aided in collecting serum and epidemiological data. Elsewhere in this report our experiences with this disease for the last two years will be summarized, supplementing the excellent reports of Aycock and Luther for the Harvard Commission. We are indeed fortunate to have the services of the Commission's staff which cannot be surpassed anywhere.

Tuberculosis. — Last year the inadequacy of hospital resources for the tuberculous in Massachusetts was emphasized. Among the principal factors were the withdrawal of two state sanatoria from service to adults so that they might serve children, the increasing demand for hospitalization among cases from 35 per cent to 53 per cent in five years, and the fact that the counties of Worcester and Middlesex had eluded building hospitals. Now these counties have accepted the act of the last Legislature and by next year their hospitals should be opening. Essex County is contemplating a much needed and substantial addition, as should Norfolk County. Hampshire County is wasting valuable time puttering with a paltry six bed addition whereas to adequately care for its own needs and those of Berkshire and Franklin a modern hospital building of 50 beds is the least that should be considered.

Hampden County should have a tuberculosis hospital of at least 175 beds to include the entire county. As is conventional, Springfield is raising the cry of having its own hospital. At best Springfield will have too small a tuberculosis hospital to warrant or hold a first class resident physician and without such no service is adequate. They talk of combining in the future as in the past their general communicable disease and tuberculosis service in an expanded plant. Such union has always proven therapeutically unholy! But if Springfield insists on standing out and if the Legislature does not override them, as it has the principal city in other counties, let Hampden, exclusive of Springfield, put up at once

¹ N. E. Journal of Medicine, 198: 73-75: March 1, 1928.

a hospital of 125 beds which is a suitable unit to give excellent service at a reasonable figure.

The four state sanatoria served 2,119 patients, of whom 344 were non-pulmonary (at Lakeville), 1,007 were children (at Westfield and North Reading) and 768 were adults (at Rutland).

Lakeville with its new surgical building is admirably combining natural heliotherapy with surgery. But with the average stay of three to five years another children's building is needed to handle without delay the growing waiting list of children for whom the most can be accomplished in the shortest time. In this building there will be an artificial heliotherapy room for use on dull days and for those patients not acclimated to out-of-door exposure in the winter.

At Westfield the out-patient service has increased 50 per cent so that the monthly visits now average 100. New quarters are urgently needed for this service which must be encouraged, and quarters for the staff, as usual, have been neglected.

At North Reading two outbreaks of scarlet fever have closed the institution for twelve weeks of the calendar year. The second is not yet over and has already killed one child. It is a parody on service to infect children who might have escaped had they stayed at home. A hospital building where all admissions can be isolated for two weeks must at once be obtained. The consultation service, both in and out of the sanatorium, is showing a pronounced growth.

Within the next year Rutland should be available to the entire state equally when Worcester and Middlesex have opened their new hospitals, and a flagrant injustice will be at an end. Consultative service on thoracoplasty is being given by Dr. E. D. Churchill and is working most satisfactorily.

Two communities only are refusing to report cases of hilum tuberculosis. As there is no doubt that these children are infected with the tubercle bacillus there can be no logical ground for this attitude. We have checked the work of all tuberculosis dispensaries and find wide variation in quality of service. Periodic meetings of official tuberculosis workers, particularly clinic physicians and nurses, should be of great value, and we contemplate inaugurating such this year.

Ten Year Juvenile Tuberculosis Program. — The school year 1927-28 was the fourth year of our school clinics. Based on studies by Chadwick and Zacks¹ we began examining all children instead of, as previously, taking only those that were (1) contacts, (2) 10 per cent or more underweight, or (3) problems in the school. As a result our examinations rose from 15 per cent of the entire school population in the first three years to 60 per cent. A comparison of the two methods of selection shows (1) that the contacts dropped from 14 per cent of those examined to 3.5 per cent, but that the reactors in both series remained at 28 per cent; and (2) although 7,000 more children were examined than in any previous year the positive and suspicious cases dropped, presumably because of the smaller proportion of contacts. In other words, by aiming at the entire population of the schools we find a smaller proportion of children with active tuberculosis, but astonishingly enough, we find the same proportion infected. Our change in examination policy would therefore seem entirely warranted.

Our reexamination clinic group, which returns annually to all communities where school clinics have been held before, finds one-third of the children not reporting. Of those reporting less than 60 per cent show improvement. Certainly, here the hardest possible thinking must be done as to methods and the utilization of the same.

Venereal Disease. — This year we appointed Dr. N. A. Nelson as epidemiologist in charge of venereal disease control and, as was anticipated, we are thinking more clearly and actively in the field of gonorrhea and syphilis than before. In addition, the Massachusetts Society for Social Hygiene was reorganized at a meeting addressed notably by Bishop Lawrence. Under the presidency of Dr. Cecil K. Drinker, Assistant Dean of the Harvard School of Public Health, this organization is on the way to becoming a force in this field as never before. In addition, Dr. E. Granville Crabtree, Dr. Harry W. Goodall and Dr. Austin W. Cheever

¹ N. E. Journal of Medicine, 200: 332-337: Feb. 14, 1929.

have been appointed as a committee to advise with us on the adequacy of available treatment resources and their desirable expansion. Such clinical quality thinking on these matters is new. In the past, persons have been motivated in venereal disease control largely by sentiment, as many of their works have shown.

Although all this has been in operation but a few months some results are already apparent. We distributed this year 63,444 doses of 0.6 gm. arsenicals as compared with 52,066 doses for 1927. In addition a recent circularization of all physicians in the state regarding available arsenicals should markedly increase this next year. Also we have sent them all copies of the Venereal Disease number of the *Commonwealth* containing articles by distinguished clinicians on treatment of both diseases. We are in the process of developing treatment standards for all clinics, and are preparing a list of speakers for medical societies through the state. A one day venereal disease incidence study was made through cooperation with the physicians in Holyoke. At the same time the Secretary of the State Social Hygiene Society, Dr. McGillicuddy, made a social survey of Holyoke. Our incidence study brought out principally the untrustworthiness of this method. However, if the ratio between cases reported for the year in Holyoke and those admitted as being under treatment on the day studied holds for the entire state, it would mean that on that day there were 162,112 cases of syphilis and gonorrhea under treatment throughout the state. To know the total cases in the state, both under and not under treatment, should we multiply this figure by 2 or 20? Then as this is a one day figure should we again multiply by 366 (since it is leap year) or by a smaller figure in order that the total may not exceed the state's population?

At the same time the Massachusetts Society for Social Hygiene contemplates putting a man into the field to meet the high school, college and father groups in much the same way that Dr. McGillicuddy has so notably done for girls and women. Also they plan to place a competent social worker in some one of the state aided venereal disease clinics to see how much she can add to the average number of visits per patient (which are scandalously low now), the family contacts brought in for examination, and the sources of infection brought under treatment. Surely there never was a public health program more in need of informed public support than this to which this Society is devoting its efforts.

Other Diseases.—With the close of the year influenza, which reports say is sweeping the rest of the country in mild form, threatens. With publicity the reported cases have increased many hundred per cent weekly. This means nothing as to incidence. So far our pneumonia deaths appear not above the average of the last five years. This is enormously significant and means either a very mild influenza or no influenza at all. So far the reports of industrial absenteeism are not excessive even in the presence of apparently widespread "colds" and "grippe." That epidemic proportions should develop is certainly not inevitable, but is aided by proprietary drugs advertisers who are active in stirring up hysteria based on a memory of 1918.

Tularemia is not in New England. Health officers of the New England States and New York met in conference and agreed that where authority does not exist for adequately quarantining imported dead and living rabbits from infected areas this should be sought. This Department and the Department of Conservation are doing so in this state.

Undulant fever is rare, if it exists in the state. The children at our two sanatoria are not infected. Laboratory diagnostic service is now offered by our laboratories. It may be found. In any case it is another argument for pasteurizing milk.

Milk.—For the third year the Committees of Public Health and Agriculture refused favorable action on our bill which would require eventually that all milk sold within the Commonwealth should be either pasteurized or from non-tuberculous cattle. We understand that such a requirement goes into effect in New York State next July and we congratulate Commissioner Nicoll. Some of the opposition here was based on the fear that it would interfere with the tuberculosis eradication campaign in cattle. Words, mere words! At a meeting of county agents recently one after another testified that the greatest single factor in their district in encouraging testing was the adoption by cities and towns of an ordinance similar to our bill. Fifty-six cities and towns, representing 57 per cent of the population, now have

such an ordinance, but at this rate to cover the remaining 299 will take some 30 years. This is too slow!

Following our discovery that there was nothing in generally applicable milk inspection that would have been sure of picking up the cow causing the septic sore throat epidemic in Lee, we have this year added a section to this milk bill requiring that all dealers selling 200 quarts or more shall have their milk either pasteurized or certified. Again up goes the cry of interference with the bovine eradication program. Again words, mere words! Any agricultural group sincerely interested in this program should have the courage to introduce legislation requiring that all milk, after a reasonable interval, must come from tuberculosis free cattle whether pasteurized or not. Such a bill would receive the support of all thoughtful health officers. For none of us believe sufficiently in Peter Pan not to know that in spite of the recent astonishing improvement in pasteurization throughout the state there are always loopholes where there is the human factor. Therefore if we knew, as in Chicago and Baltimore, that all the milk coming to our pasteurizing plants was free of tubercle bacilli we would be just that much surer of the finished product.

In addition to adequate pasteurization the Department feels that a satisfactory milk supply must come from healthy animals and be under constant adequate inspection as to methods of handling and proper cooling. Yet in both these directions those who claim interest in a safe raw product are thwarting us. A more frankly insincere position it would be difficult to imagine. With the laws governing pure foods, bakeries, cold storage and the like, the impetus for minimum standards did not come in any instance from the industry involved. So with milk! Under the law our duty is to arouse the public, and when aroused it will brook no delay.

District Health Officers. — Six health districts, into which we divided the state something over a year ago, are not enough. Some are too large to be covered adequately. As soon as appropriations are available, we must again have seven. So with our nursing consultants, the present four must be increased. Our district health officers' time is taken up largely with communicable disease control and investigation, surveys, diphtheria immunization, preliminary work for the ten year tuberculosis clinics (which is now largely over) and the like. Whether these men would be more effective each with a single project all over the state, or as they are with multiple projects in a limited area where they know the principal personality difficulties, is a problem. Is it not the same problem of the specialist versus the generalist which is rocking medicine, pedagogy, industry and all other fields? And the answer is not yet.

Laboratories. — Our diagnostic laboratory examined over 28,000 specimens and has added service in suspected cases of undulant fever. In each outbreak of disease it has rendered notable service. But some method of increased flexibility must be evolved so that when suddenly inundated with the enormous volume of work incident to an epidemic, which demands the most prompt and careful handling, the staff can still carry on the important heavy routine grind without impossible exploitation, as in the past.

The Antitoxin and Vaccine Laboratory is well established in its enlarged quarters which allow for expansion and increased efficiency. They now manufacture the silver nitrate ampules for use in the eyes of the new born and process the convalescent serum for the Harvard Infantile Paralysis Commission, besides the multiple standard therapeutic and prophylactic products and research. The Director, Dr. White, has just returned from a brief visit to the laboratories of Europe with much of great value to the state. The outstanding accomplishment of our Wassermann Laboratory is the development by Dr. Hinton of the glycerol cholesterol method of detecting syphilitic infection which is simpler and appears to be more reliable than the Wassermann or the Kahn tests.

II. NON-COMMUNICABLE DISEASES.

Of the 50,000 odd deaths in the state annually something around 16 per cent are due to communicable diseases that are reportable. Yet listening to any group of health officers you would think that this group of death and disease was over-

whelmily the most important with perhaps an occasional passing reference to the maternal and infant problem. But 80 per cent of the deaths are from non-communicable diseases. Heart disease leads as the "captain of the men of death", killing one in every four, while cancer kills one in ten. Well over half the deaths are from the degenerative diseases of later life and yet over half this report is devoted to communicable disease. Convention has a tenacious hold!

Cancer. (a) Hospital. — The Pondville Hospital treated 753 patients this year and for the last five months has had a more or less persistent waiting list. About two-thirds have left the hospital benefited, but in all instances to remain under periodic observation. The interest of the staff is shown by the fact that autopsies were obtained on 45% of the deaths.

The out-patient service has grown till about 30 patients are seen at each weekly session. This is far in excess of what was anticipated and the quarters are grossly inadequate. An addition must be provided for adequate clinic service, and, if the waiting list persists, for twenty-four more beds.

Two county medical society meetings and one meeting of the state aided clinic staffs were held at the hospital during the year. The general expression of appreciation of the excellence of the medical and nursing service was most gratifying. As our visiting staff give over 150 hours each month, a reason for the high quality of individual service is apparent.

(b) Clinics. — In eleven cities and towns new state aided clinics were opened during the year, making the total now 17 cities and towns in the state which have such clinics. Probably at least two more will be opened this year, and then we will be near the point of saturation. These clinics have served 2,542 persons this year, of whom 728 had cancer. The most baffling problem is to maintain uniform quality of service in any such decentralized system. Semi-annual staff meetings are planned, the first one having been attended by about a third of the clinic staffs. In the spring we plan to cooperate with the cancer committee of the State Medical Society and the Massachusetts Branch of the American Society for the Control of Cancer in offering a three day post-graduate course in cancer to all the physicians of the state. Since after our campaign last spring we found that 22 persons attended the private office for every one attending the clinic, the reason for the course is apparent.

The social service staffs and educational committees met also at Pondville. Competent social work and responsible local interest are indispensable to clinic success.

(c) Education and Studies. — Last spring a five day campaign was staged all over the state in cooperation with the State Medical Society and the American Society for the Control of Cancer. Meetings for the public and the profession, clinics, broadcasts, newspaper articles, a special cancer number of the New England Medical Journal, posters, and the like were employed. From a questionnaire to all doctors and a study of clinic figures it was estimated that 12,000 persons came under immediate medical care for cancer during the month following the campaign. A higher proportion came to private doctors in cities where there were clinics than where there were not. This was of course because of the excellent work of the Cancer Education Committees in these cities. Of these people, 1,500 were found to have cancer. In the immediate future we plan for local rather than state wide campaigns, and are pushing a year round educational program. However, to maintain the interest of the local committees is one of the problems of our staff.

During the year 102 addresses were given to over 6,000 persons. There were 12 radio talks. Over 100,000 pamphlets on cancer were distributed and our incomplete files show over 8,000 inches of newspaper space devoted to the subject.

Studies of nationality and type of cancer are being continued from our death returns, records from Ireland and Italy having been obtained through the League of Nations with which to compare our records of these nationalities in this state. Other aspects of nationality are being taken up through cooperative studies at the Massachusetts General Hospital and the Boston Dispensary. The collection of data on the cancerous and non-cancerous by Visiting Nursing Associations

throughout the state is being continued. A preliminary report¹ on the early data has already been published. Sickness studies in Winchester and Shelburne Falls have been published² and data from a survey of 28,000 individuals in Lawrence is being tabulated. The Overseers of the Poor of Cambridge are giving us an opportunity to make a morbidity-sociological survey of some 300 families under their care. The mass of material is enormous and out of it should come not only a clearer conception of cancer in Massachusetts but also of the other degenerative diseases. On this we should be able to build a surer preliminary program than time permitted us to in cancer.

Divisional Reorganization. — This year we plan to create a Division of Adult Hygiene out of the present staff of 15 in our cancer section. Also the Division of Hygiene will become the Division of Child Hygiene.

Child Hygiene. — Our limited resources in this field can be most effectively used by educating the educators, be they teachers, parents, public health nurses or responsible non-professional persons. This is accomplished by all the methods from the didactic lecture to the casual conversation and the service demonstration. Add to this our legal responsibility to fact find in regard to causes of sickness among mothers and children and you have a large order. There is probably no field, not excepting the venereal, more cluttered with the underbrush of fallacy and less illumined by fact than that of child hygiene.

(a) *Maternal, Infant and Pre-School Work.* — Five thousand persons received the prenatal and 12,000 the postnatal letters monthly. During the last six months a new letter service to expectant fathers was started and nearly 3,000 were sent. Limited studies of neonatal and postnatal deaths were made. These must be extended. Most of our energies in this field were taken up by the Well Child Conferences. One hundred and eighty-one have been held since 1924, of which 42 were held this year in 38 different towns. Of all these, 23 communities have organized such conferences permanently and 17 more have nurses doing weighing and measuring. With the Nursing Consultant covering Franklin County, an intensive effort over a number of years is planned to study the permanent value of this service. The great need of it in small rural towns is at once apparent.

(b) *School Hygiene.* — In three years 22 communities have asked surveys of their school health service. This will be offered again this year. At the Hyannis Normal School 32 public health nurses, 21 teachers and 8 dental hygienists took the special six weeks summer courses given again cooperatively by the Department of Education and this Department. The demonstration of health service at the Salem Normal School is continued. The two Departments again held five school hygiene conferences in various parts of the state. They were attended by some 350 school physicians, superintendents, school nurses, school committee members, dental hygienists and others. A preliminary effort to study the relative health of continuation and high school students was made.

(c) *May Day and Summer Round-Up.* — Child Welfare Committees to sponsor this work have been organized in 141 cities and towns. Child Health Day exercises were held in 233 communities and over 112,000 children were given rewards for hygienic accomplishments. Seventy-eight communities continued this interest into the Summer Round-Up of children about to enter school for the first time. After a physical examination, efforts are made to correct defects, administer immunizations and the like that children may enter school as fit as possible.

(d) *Dental Hygiene.* — The Dental Advisory Committee has been active in developing a program for the School Dental Hygienist, and in other matters. Six Regional Dental Consultants have been appointed by the Massachusetts Dental Society who are of great help to us in conference on dental hygiene matters in their districts. A State Association of School Dental Workers has been organized with a membership of 353. Our Dental Consultant is secretary and editor of their Monthly Bulletin. Over 200 communities were active in the dental hygiene part of the Child Health Day Program. Still the principal problem is

¹ New England Journal of Medicine, 198: 481-487: April 26, 1928.

² American Journal of Public Health, 18: 1089-1097: September, 1928. New England Journal of Medicine, 198: 625-629: May 10, 1928.

to find competent personnel for the interested communities. As in other fields, the harvest ripens quicker than the competent staff.

(e) *Nutrition and Health Education.*—Four of our nutritionists are with the ten year tuberculosis program clinics in the schools. Last year they interviewed 7,825 children in regard to diet and undernourishment, of whom 6,494 were accompanied by parents. The cooperation of the State Agricultural Extension Service has been obtained in nutritional work. Service is given to summer camps and others interested, and much printed matter is prepared.

Two million and a quarter pieces of printed matter were distributed by the Division of Hygiene, three-quarters of a million being the health material especially prepared for the art department of the schools. Five hundred and sixty-two lectures were given. The demand for posters particularly in the high schools cannot be met.

(f) *Nursing Consultants.*—Obviously the four nursing consultants cannot adequately cover the state. Their number must be increased and their districts contracted. When it is realized that there are over 1,100 public health nurses in the state for conference with whom they should be available, the size of their task is apparent.

III. ENVIRONMENTAL CONTROL.

Probably the most important single responsibility of the Department so far as health is concerned is the supervision of the public water supplies. That this has been effective is attested by our phenomenally low typhoid death rate. With the increasing congestion of the country adequate protection grows constantly more difficult, particularly for the small supplies with little or no storage, or with inadequately maintained treatment works.

Our Engineering Division received a large number of applications for advice, exceeded only by 1927. This was because the high rainfall during the drier months this year kept down many complaints received during the dry year previous. More and more time is being taken by water supply, fire protection and sewage disposal problems at our five institutions. There is danger of this encroaching on the larger and more important supervisory functions of the Division.

As was pointed out in the investigation of the conditions of the waters of Quincy Bay which has been reported to the General Court, there are serious pollutions of the harbor waters in and about the Metropolitan district which appear to the Department to make desirable a general investigation of sewerage conditions in this area, including both the north and south Metropolitan sewerage districts, to determine what changes may be necessary or desirable to prevent the creation of objectionable conditions in any of the local waters about the district.

Recreation Sanitation.—This is a matter of increasing importance since our recreation load is growing annually. More complaints in regard to conditions of bathing beaches were received this year than formerly. The matter of the pollution of the Metropolitan waters, just referred to, has an important bearing in this matter. We are asking for an addition to our staff for the study of the beaches next summer. Our laboratory and field staff have also done much work on swimming pools.

The shellfish problem of the state is being studied by a Special Legislative Committee. It is hoped that they may suggest a more effective way of handling the conservational, commercial, fraudulent, law enforcement and health aspects of the problem than at present and that we may be relieved of the many extraneous phases of this matter which have been forced on us and which have been the cause of endless irritation and embarrassment. Particular attention this year has been given to studying the problems attendant on the municipal clam chlorinating plant at Newburyport.

We are offering advice on water and sewerage problems connected with camps and fair grounds so far as our resources permit. But those responsible for these activities should seek the advice sufficiently in advance to allow a study of their problem.

Food Supervision.—There appear still to be those commercially interested in the multiple aspects of our food supply who are willing to descend to almost any

practice for gain. It is regrettable because when exposed they destroy public confidence also in the vast majority in this industry who maintain of their own initiative minimum standards of decency.

Again we have removed local slaughtering inspectors for illegally passing tuberculous carcasses for food. It would seem that all aspects of the tuberculosis eradication work in cattle, from the original application for the test to the eventual disposition of the carcass, are fraught with the danger of the most varied forms of dishonesty of any problem of which the Department has knowledge.

In the various phases of food supervision the Division of Food and Drugs examined about 19,000 specimens. We have added bacterial analysis, particularly of Grade A and other pasteurized milk. As has been said, the general improvement in the process of pasteurizing milk has been astonishing in the last year and a half. But in its supervision we are again faced with local indifference. Cities and towns are loud in decrying usurpation of authority by the state. Yet in this, as in many other matters, with a few admirable exceptions, any pretense at supervision must come from the state. This is too important a matter to let any "I won't do it and you mustn't" attitude jeopardize the public safety.

The milk inspection demonstration in Berkshire County is of enormous future importance. The small community cannot economically give modern adequate milk inspection. This means pooling of resources in districts or counties, and is another argument for the union health district. Our demonstration in the Berkshires is hampered principally by indifference and an inability to staff it locally with trained disinterested personnel. Our veterinary inspectors are being more and more called on for dairy inspection in connection with suspected outbreaks of milk borne disease and are invaluable.

IV. BUDGET.

This year our budget, including the five institutions, has been about two million and a quarter. For the coming year we are asking for almost a million more, the increases being due largely to needed expansion of the institutions, increase in the tuberculosis subsidy to cities and towns (which money is never by any chance spent for health service), and minor expansions of service throughout the Department. Yet of this very large budget only about 25 per cent can be said to be expended on strictly public health work. The rest is spent largely for public disease with some for fraud prevention. How far can this practice be continued without jeopardizing the primary responsibilities of a department of public health?

V. PERSONNEL.

The organization of the Public Health Council has not changed during the past year, the Governor having reappointed Mr. Hutchins and Dr. Ryan at the expiration of their terms.

After thirteen years of service with the Department, three as a district health officer and ten as the Director of the Division of Hygiene, Dr. Merrill E. Champion resigned at the end of this fiscal year for work elsewhere. In accepting his resignation the Public Health Council expressed deep appreciation of his long service to the Department. Early next year he will be succeeded by Dr. M. Luise Diez.

Dr. Nels A. Nelson was appointed Epidemiologist in the Division of Communicable Diseases on April 16, 1928, and is devoting his entire time to venereal disease control work.

Dr. Paul Wakefield was appointed as Supervisor of Tuberculosis Clinics on January 1, 1928, to fill the vacancy which had existed through the transfer of Dr. George M. Sullivan from this position to that of State District Health Officer during the previous year.

On January 30, 1928, Dr. Hubert A. Boyle was transferred from the Westfield State Sanatorium to the position of Tuberculosis Clinic Physician.

VI. ORGANIZATION.

The organization of the Department is as follows:

Commissioner of Public Health	George H. Bigelow, M.D.	
Public Health Council		6
Division of Administration:		
Secretary (1), Statistical Consultant (1), Clerks and Stenographers (11)		13
(Cancer Section):		
Epidemiologists (2), Social Worker (1), Public Health Education Worker (1), Clerks and Stenographers (10)		14
Division of Biologic Laboratories:		
Benjamin White, Director.		
Assistant Director (1), Chemists and Bacteriologists (6), Laboratory Assistants (4), Laboratory Helpers (9), Stable Foreman (1), Stablemen and Laborers (14), Janitors (2), Clerks and Stenographers (3).		
(Wassermann Laboratory):		
Chief of Laboratory (1), Bacteriologists (2), Laboratory Helpers (5), Clerks and Stenographers (3)		52
Division of Communicable Diseases:		
Clarence L. Scamman, M.D., Director and Deputy Commissioner.		
District Health Officers (6), Epidemiologist (1), Clerks and Stenographers (5).		
(Diagnostic Laboratory):		
Bacteriologists (4), Laboratory Assistant (1), Laboratory Helpers (5), Clerks and Stenographers (2).		
(Venereal Disease):		
Epidemiologist (1), Special Investigator (1), Social Worker (1), Lecturer (1), Clerks and Stenographers (2)		31
Division of Food and Drugs:		
Hermann C. Lythgoe, Director.		
Chemists (6), Veterinary Inspectors (3), Food Inspectors (6), Laboratory Helpers (2), Clerks and Stenographers (7)		25
Division of Hygiene:		
Merrill E. Champion, M.D., Director.		
Dental Hygienist (1), Nutritionists (5), Educational Workers (2), Child Welfare Physician (1), Clerks and Stenographers (8).		
(Maternal and Infant Hygiene):		
Child Welfare Physician (1), Nursing Supervisors (4), Clerks and Stenographers (4)		27
Division of Sanitary Engineering:		
X. H. Goodnough, Chief Sanitary Engineer.		
Engineers and Engineering Assistants (15), Clerks and Stenographers (10)		26
Division of Tuberculosis:		
Sumner H. Remick, Director.		
Assistant Director (1), Field Nurses (4), Superintendent of Sanatoria Construction (1), Examiner of Settlements and Support Claims (1), Clerks and Stenographers (6).		
(Tuberculosis Clinics):		
Supervisor of Tuberculosis Clinics (1), Child Welfare Physicians (5), Nurses (3), Clerks and Stenographers (7), Chauffeur (1)		31
Division of Water and Sewage Laboratories:		
Harry W. Clark, Director.		
Chief of Laboratory (1), Chemists and Bacteriologists (8), Laboratory Assistants (2), Mechanical Handyman and Laborer (2), Watchman (1), Clerks and Stenographers (2)		17
Total		243

The quota of employees at each of the institutions under the supervision of the Department is as follows:

Lakeville State Sanatorium	160	
North Reading State Sanatorium	119	
Rutland State Sanatorium	207	
Westfield State Sanatorium	145	
Pondville Hospital	94	725
		<hr/>
Grand total for the Department		968

VII. PUBLICATIONS.

The following articles have been published by members of the staff:

Division of Administration.

Present Resources for Handling Tuberculosis in Massachusetts

Dr. George H. Bigelow

Boston Medical and Surgical Journal 197:1517-1520 February 9, 1928

Are "Alcohol Deaths" Due to Alcohol?

Dr. George H. Bigelow

New England Journal of Medicine 198:227-228 March 22, 1928

Experience with the Program of Cancer Control in Massachusetts

Dr. George H. Bigelow and Dr. Herbert L. Lombard

American Journal of Public Health, April, 1928

Results of Massachusetts Cancer Campaign

Dr. Franklin G. Balch, Dr. George H. Bigelow and Dr. Robert B. Greenough

New England Journal of Medicine 199:430-434 August 30, 1928

The Relative Position of Diabetes as a Cause of Death

Angeline D. Hamblen and Dr. Elliott P. Joslin

New England Journal of Medicine 199:19 November 8, 1928

Cancer Section.

Cancer Studies in Massachusetts. 2. Habits, Characteristics and Environment of Individuals With and Without Cancer

Dr. Herbert L. Lombard and Dr. Carl R. Doering

New England Journal of Medicine, April 26, 1928

Progress in Massachusetts Cancer Program

Dr. Robert B. Greenough, Dr. Herbert L. Lombard, Dr. Carl R. Doering,

Dr. Daniel Fiske Jones, Dr. David Cheever, Dr. George Gilbert Smith
and Dr. Ernest M. Daland

New England Journal of Medicine, April 26, 1928

A Morbidity Survey of Shelburne-Buckland

Dr. Herbert L. Lombard and Dr. Clarence L. Scamman

New England Journal of Medicine, May 10, 1928

Endemic Goiter in Massachusetts

Dr. Carl R. Doering, Dr. Herbert L. Lombard and Dr. Fredrika Moore

New England Journal of Medicine, July 19, 1928

A Sickness Survey of Winchester, Mass. Part 1. General Mortality

Dr. Herbert L. Lombard

American Journal of Public Health, September, 1928

Putting Health Knowledge to Work

Dr. Mary Ropes Lakeman

The Adult Bible Class Magazine, August, 1928

Whats and Whys of Cancer

Cancer? Be Quick!

Dr. Herbert L. Lombard

The Catholic Mother, August, 1928

Cancer Studies by the State
Dr. Herbert L. Lombard
The Catholic Mother, September, 1928

Illness in City and Country
Dr. Herbert L. Lombard
The Survey, September 15, 1928

A State Cancer Program
Dr. George H. Bigelow
Illinois Health News, December, 1928

Division of Communicable Diseases.

Diphtheria Epidemic—Marlborough, August–November, 1927
Dr. Edward A. Lane
New England Journal of Medicine 198:135–157 March 8, 1928

Diphtheria Deaths in Massachusetts, 1926
Dr. Edward A. Lane and Dr. Filip C. Forsbeck
New England Journal of Medicine 198:73–75, March 1, 1928

Administrative Control of Communicable Diseases
Dr. Clarence L. Scamman
American Journal of Public Health 18:429–432 April, 1928

An Outbreak of Typhoid Fever Traced to Corned Beef Infected by Carrier
Dr. Clarence L. Scamman and Dr. Filip C. Forsbeck
New England Journal of Medicine 199:664–665 October 4, 1928

Diphtheria Deaths in Massachusetts (Third Chronological Report)
Dr. Edward A. Lane
New England Journal of Medicine 199:939–944 November 8, 1928

Division of Sanitary Engineering.

Rainfall in New England During the Storm of November 3–4, 1927
X. H. Goodnough
The Journal of the New England Waterworks Association, Vol. 42, No. 2,
June, 1928

Division of Hygiene.

A Study of 370 Deaths of Primiparae
Dr. Mary F. DeKruif
New England Journal of Medicine, December 27, 1928

Winchester Study, Part III — Physical Defects in School Children
Dr. Fredrika Moore and Angeline D. Hamblen
American Journal of Public Health, October, 1928

Getting the Child Ready for School
Dr. Fredrika Moore
American Education, March, 1928

Division of Food and Drugs.

Report on Qualitative Tests for Dairy Products
Sydney H. Hall
Journal of the Association of Official Agricultural Chemists p. 299, 1928

Division of Tuberculosis.

The Diagnosis and Prognosis of Juvenile Tuberculosis
Dr. Henry D. Chadwick
Boston Medical and Surgical Journal, Vol. 197, No. 20, pp. 1399–1401 Janu-
ary 26, 1928

The X-Ray and Clinical Diagnosis of Tuberculosis in Children
Dr. Henry D. Chadwick
American Review of Tuberculosis, Vol. XVIII, No. 4, April 1928

The Incidence of Tuberculosis Infection in School Children

Dr. Henry D. Chadwick and Dr. David Zacks

New England Medical Journal Vol. 200, No. 7, pp. 332-337, February 14, 1929.

Juvenile Tuberculosis

Dr. Henry D. Chadwick

Kentucky Medical Journal

Occupational Therapy as an Aid in the Treatment of Chronic Disease

Dr. David Zacks

Manual of Occupational Therapy of the Massachusetts Association for Occupational Therapy

Division of Water and Sewage Laboratories.

Iodine in the Public Water Supplies of Massachusetts

Harry W. Clark

Journal of the New England Water Works Association, Vol. XLII, No. 2, June, 1928

In addition there were numerous clinical publications by members of the Visiting Staff of the Pondville Hospital.

VIII. NEW LEGISLATION.

The Department is submitting the following new proposed legislation:

1. *Milk.*

As the only feasible means of preventing a repetition of the calamitous epidemic of septic sore throat which visited Massachusetts last summer, sickening 1,000 persons in a town of 4,000 and killing 43, the Department is introducing a bill which requires that all dealers handling two hundred quarts of milk or more shall have that milk either pasteurized or certified. Apparatus can now be bought that will adequately pasteurize as small an amount as two hundred quarts. While it is true that smaller amounts may infect, they cannot infect in any such wholesale way, and it is not felt at this time that the smaller dealers can economically be required to pasteurize. However, for the protection of the public health the Department recommends that all persons insist on pasteurized milk or that they boil it in the home. We would point out that a raw milk that can underbid a pasteurized milk is not a safe milk. We would also point out that the above requirement applies to all milk sold in Boston beginning with the new year, and we wish to commend the Boston Health Department for its stand on this matter.

The Department wishes to reaffirm its stand that a satisfactory milk supply depends on healthy cattle and adequate inspection of methods of handling as well as adequate pasteurization. The section above referred to is added to the bill which the Department has introduced annually for three years, requiring that ultimately all milk sold within the Commonwealth should be either pasteurized or from non-tuberculous cattle. Those who oppose the Department's stand on pasteurized milk claim that they favor this part of the bill, yet they seem strangely absent when it has been heard in the past. Tuberculosis spread by milk killed over one hundred persons last year in this State, as well as filling the Lakeville State Sanatorium and other hospitals for cripples. This must stop.

Legislation to improve general milk inspection, we hope, will be introduced by others. But in re-emphasizing the health importance of pasteurization we would remind the public that last summer there were also outbreaks of scarlet fever and typhoid fever traced to raw milk.

2. *Regulation of the Inspection of Certain Meats.*

Tularemia is a purulent disease with a mortality of 4 per cent which is spread by infected rabbits. It has been found in all parts of the country except New England. Dead rabbits are brought into our markets from the West. Some of these are undoubtedly infected and will infect those handling the carcasses before cooking. A limited refrigeration will prevent this. We ask authority to require such refrigeration by regulation. The problem of the infected living rabbit

brought in for restocking or other purposes will be handled by the Department of Conservation.

Representatives of the New England States and New York met to discuss this matter and voted that where such authority did not at present exist it should be asked. It does not at present exist in Massachusetts.

3. *Amending the Pure Food Law.*

This amendment is aimed to make enforcement of the pure food law more adequate in the State. In certain instances evasion on technicalities has been possible.

4. *Allowing Expenditures for Public Health Education.*

The Attorney General's office pointed out this year that while the basic law defining the duties of the Department of Public Health directed that it "gather such information . . . as it considers proper for diffusion among the people," it did not direct that the same be diffused. This might suggest that all public health education by the Department is illegal. As obviously it is improper to spend the people's money to inform only ourselves and to fill our files, we ask that the words "and disseminate" be included.

FINANCIAL STATEMENT.

Appropriations and Expenditures for the Year ended Nov. 30, 1928.

	Appropriations.	Expended.
Division of Administration	\$37,740 00	\$36,697 48
Division of Hygiene	47,875 00	47,469 21
Maternal and Infant Hygiene	30,400 00	29,648 01
Division of Communicable Diseases	77,050 00	75,672 47
Veneral Diseases	43,450 00	41,509 11
Division of Food and Drugs	61,700 00	58,053 09
Administration of Shellfish Law	4,400 00	3,291 55
Division of Biologic Laboratories:		
Antitoxin and Vaccine Laboratory	96,900 00	96,769 05
Wassermann Laboratory	19,100 00	18,735 10
Division of Sanitary Engineering	79,700 00	74,500 10
Division of Water and Sewage Laboratories	46,100 00	45,690 03
Division of Tuberculosis	43,400 00	41,488 26
Subsidies to Cities and Towns	232,000 00	230,361 27
Tuberculosis Clinic Units	58,540 00	56,617 59
Cancer Clinics	50,000 00	48,364 36
Totals	\$928,355 00	\$904,866 68

Special Appropriations and Expenditures for the Year ending Nov. 30, 1928.

	Appropriations.	Expended.
Investigation, sanitary condition, Quincy Bay, chapter 12, Resolves of 1928	\$3,000 00	\$1,791 77
Investigation, pollution of Saugus River, chapter 9, Resolves of 1928	1,400 00	270 61
Investigation, condition of Merrimack River, chapter 26, Resolves of 1928	1,000 00	267 30
Investigation, unsanitary condition, Savin Hill Bay, chapter 39, Resolves of 1928	1,500 00	133 07
Totals	\$6,900 00	\$2,462 75

GEORGE H. BIGELOW, M.D.,
Commissioner of Public Health.

REPORT OF THE DIVISION OF SANITARY ENGINEERING.X. H. GOODNOUGH, *Director and Chief Engineer.*

OVERSIGHT AND CARE OF INLAND WATERS.

Water Supply and Sewerage.

During the year 1928 404 applications were received by this Department for the approval of plans for systems of water supply, drainage and sewerage and for the advice of the Department relative thereto. This number was somewhat less than was received during the year 1927 but greater than in any other previous year. Of this number 268 related to water supply, 9 to sources of ice supply, 41 to sewage and sewage disposal, 24 to pollution of streams, and 62 to miscellaneous matters.

New water supplies were introduced during the year into the towns of Wilmington and Marshfield, making the total number of cities and towns supplied with water from public works at the end of the year 222 out of the total of 355 cities and towns in the State.

The rainfall for the year 1928 amounted to 42.46 inches or 2.05 inches below the normal as determined from observations at eight stations in different parts of the State having rainfall records for more than 50 years. The rainfall was less than the normal in the months of January, February, March, May, October, November and December, and was about the normal in August and September, but in April, June and July it was considerably above the average precipitation in those months. The excessive rainfall of November and December, 1927, together with the heavy rains during June and July, caused the yield of the streams in 1928 to be well above the normal throughout the State.

The total rainfall during the year 1928 on the watershed of the Wachusett Reservoir in the central portion of the State was 44.01 inches or 1.30 inches below the normal for this area. An excess of rainfall occurred in April, June, July and August. The rainfall for the months of February and September was about normal, while the precipitation in the remaining months was deficient. The total rainfall in the last three months of the year was 4.51 inches below the normal.

The excessive precipitation during the months of October, 1927, to February, 1928, inclusive, followed by very heavy rains during April, June, July and August, caused the yield of this watershed to be somewhat in excess of the normal. The average yield during the year was 1,176,000 gallons per day per square mile, which was 82,000 gallons in excess of the normal. The yield during the months of March, October, November and December, was below the normal. The greatest excess occurred in the month of June. The excessive rainfall in the latter part of 1927 and in some of the earlier months of 1928 caused the Wachusett Reservoir to reach its high water mark about the latter part of April, at which level it was maintained until about the middle of August. At the end of the year the water level was about 6.2 feet below high water.

Metropolitan Water Supply.

Work upon the construction of a tunnel from Wachusett Reservoir to the Ware River at Coldbrook and also on acquiring property in the valley of the Swift River at the site of the proposed new reservoir on this river has progressed rapidly throughout the year, and it is expected that the works will be available for the diversion of water from the Ware River into Wachusett Reservoir some time during the year 1931.

SANITARY PROTECTION OF PUBLIC WATER SUPPLIES.

At the request of the water department of the city of Haverhill rules and regulations were established for the protection of Lake Saltonstall, one of the sources of water supply available to that city.

The cities, towns and districts, for which rules and regulations had been established for the sanitary protection of their water supplies up to the end of the year 1928 are the following:

Abington and Rockland	Greenfield	North Andover
Adams	Haverhill	Northborough
Amherst	Hingham and Hull	Norwood
Andover	Holden	Peabody
Ashburnham	Holyoke	Pittsfield
Ashfield	Hudson	Plymouth
Attleboro	Lakeville (State Sanatorium)	Randolph and Holbrook
Braintree	Lee	Rockport
Brockton and Whitman	Leicester (Cherry Valley and Rochdale)	Russell
Cambridge	Leominster	Rutland
Chester	Lincoln and Concord	Salem and Beverly
Chicopee	Lynn	Scituate
Cohasset	Marlborough	Springfield
Concord	Maynard	Springfield and Ludlow
Dalton	Medfield (State Hospital)	Stockbridge
Danvers and Middleton	Metropolitan Water District	Taunton
Easthampton	Milford	Wakefield
Fall River	Montague	Westfield
Falmouth	Newburyport	West Springfield
Fitchburg	Norfolk (State Hospital)	Weymouth
Gardner	Northampton	Williamsburg
Great Barrington		Winchester
(Housatonic)		Worcester

Connection of Auxiliary Fire Supplies with Public Water Supply Systems.

The examinations of connections between the water pipes of private fire supplies, or manufacturing or other supplies, used in factories or other establishments and the pipes of public water supplies have been continued during the year with the view of eventually eliminating such connections.

Many of these connections are protected by a system of double check valves so located and constructed that they are readily accessible for cleaning and inspection, and many of these are subject to frequent and regular inspections by insurance departments, the authorities of cities and towns, etc. Where such connections are found having only single check valves or check valves which are inaccessible for proper inspection, or where the protection against the pollution of a public water supply is less than that furnished by double check valves, the Department has recommended their elimination unless more adequate protection is immediately provided.

EXAMINATION OF PUBLIC WATER SUPPLIES.

Examinations have been made of many of the sources of water supply in the State during the past year and the condition of the waters in nearly all of these sources has been determined by analyses. The number of microscopical and bacterial examinations has increased over the number of such examinations made during the year 1927, especially in connection with the examination of Metropolitan sources of supply. The average yearly results of the chemical analyses of the sources of supply during the year 1928 are given in the following table:

Analyses of the Water of Public Water Supplies.
Averages of Chemical Analyses of Surface-Water Sources for the Year 1928.
 [Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus- pended.		
Metropolitan Water District	Wachusett Reservoir, upper end	30	3.84	.0020	.0138	.0017	.23	1.0
	Wachusett Reservoir, lower end	20	3.88	.0016	.0109	.0015	.26	1.1
	Sudbury Reservoir	24	4.24	.0021	.0144	.0026	.31	1.5
	Framingham Reservoir No. 3	25	4.54	.0022	.0151	.0030	.33	1.6
	Hopkinton Reservoir	58	4.60	.0015	.0158	.0016	.34	1.2
	Ashland Reservoir	67	4.83	.0020	.0183	.0025	.38	1.3
	Framingham Reservoir No. 2	77	5.92	.0047	.0221	.0035	.50	1.5
	Lake Cochituate	26	7.53	.0029	.0168	.0027	.86	2.8
	Chestnut Hill Reservoir	25	4.85	.0016	.0123	.0016	.36	1.7
	Weston Reservoir	24	4.53	.0020	.0140	.0017	.31	1.6
	Spot Pond	17	4.26	.0026	.0124	.0019	.33	1.6
	Tap in State House	21	4.57	.0011	.0126	.0020	.40	1.6
	Tap in Revere	14	4.26	.0009	.0113	.0018	.34	1.5
	Tap in Quincy	18	5.17	.0006	.0093	.0008	.45	2.1
Abington	Big Sandy Pond	10	3.65	.0019	.0121	.0010	.71	0.9
Adams (Fire District)	Dry Brook	25	7.43	.0010	.0098	.0013	.11	5.1
	Bassett Brook	01	4.39	.0008	.0044	.0011	.10	2.0
Amherst	Amethyst Brook large reservoir	40	3.98	.0009	.0083	.0013	.18	0.6
	Amethyst Brook small reservoir	17	3.77	.0022	.0092	.0020	.18	0.8
Andover	Haggett's Pond	19	4.63	.0016	.0149	.0020	.39	1.8
Ashburnham	Upper Naukeag Lake	07	3.24	.0034	.0060	.0009	.15	0.7
Ashfield	Bear Swamp Brook	16	4.95	.0004	.0060	.0007	.11	2.9
Athol	Phillipston Reservoir	75	4.25	.0052	.0429	.0238	.16	0.9
	Buckman Brook Reservoir	20	3.14	.0056	.0290	.0169	.13	0.5
	Thousand Acre Meadow Brook	2	0.33	.0069	.0297	.0031	.15	1.2
	Inlet of filter	26	3.46	.0047	.0121	.0029	.15	0.8
	Outlet of filter	25	3.47	.0015	.0120	.0021	.15	0.9
Barre	Reservoir	12	3.95	.0013	.0117	.0015	.15	1.1
Blandford (Fire District)	Freeland Brook	03	3.50	.0004	.0023	.0004	.19	1.4
BROCKTON	Silver Lake	07	4.01	.0015	.0132	.0023	.57	0.9
Brookfield	Cooley Hill Reservoir	13	3.96	.0018	.0184	.0036	.20	1.1
CAMBRIDGE	Lower Hobbs Brook Reservoir	19	5.77	.0030	.0209	.0030	.47	2.3
	Upper Hobbs Brook Reservoir	45	6.16	.0030	.0249	.0038	.48	2.3
	Stony Brook Reservoir	43	6.65	.0029	.0208	.0034	.56	2.7
	Fresh Pond	06	8.76	.0050	.0152	.0028	.70	4.3
Cheshire	Thunder Brook	03	5.95	.0006	.0024	.0005	.09	3.7
	Kitchen Brook	04	5.22	.0022	.0021	.0005	.09	3.2
Chester (Fire District)	Austin Brook Reservoir	07	3.85	.0009	.0069	.0011	.10	1.6
	Horn Pond	14	4.07	.0007	.0098	.0009	.10	1.6
CHICOPEE	Morton Brook	04	5.11	.0038	.0035	.0006	.29	1.6
	Cooley Brook	53	4.69	.0081	.0205	.0063	.19	1.3
Clinton	Tap in town	19	4.22	.0008	.0127	.0030	.19	1.4
Colrain (Griswoldville)	McClellan Reservoir	07	7.55	.0003	.0083	.0006	.12	4.6
Colrain (Fire District No. 1)	Mountain Brook Reservoir	03	7.07	.0006	.0025	.0001	.08	5.1
Concord	Nagog Pond	03	3.24	.0017	.0149	.0050	.38	0.9
Dalton (Fire District)	Egypt Brook Reservoir	19	3.52	.0006	.0083	.0009	.08	0.9
	Windsor Reservoir	41	5.58	.0077	.0193	.0042	.10	2.4
	Cady Brook	21	4.59	.0017	.0108	.0026	.09	2.2
Danvers	Middleton Pond	58	5.09	.0047	.0194	.0025	.40	1.3
	Swan Pond	30	5.04	.0036	.0206	.0024	.39	1.9
Deerfield (South Deerfield Water Supply District)	Roaring Brook	06	5.98	.0014	.0037	.0005	.13	3.5
Egremont (South)	Goodale Brook	00	4.22	.0004	.0019	.0005	.08	2.4
FALL RIVER	North Watuppa Lake	13	3.92	.0020	.0140	.0017	.51	1.0
Falmouth	Long Pond	07	3.65	.0007	.0059	.0007	1.01	0.5
FITCHBURG	Meetinghouse Pond	09	3.27	.0030	.0153	.0021	.20	1.0
	Scott Reservoir	14	3.59	.0041	.0201	.0051	.22	0.7
	Wachusett Lake	08	3.01	.0021	.0144	.0017	.20	0.8
	Falulah Brook	24	3.33	.0020	.0124	.0028	.18	0.5
	Ashby Reservoir	24	3.06	.0040	.0178	.0034	.16	0.6
GARDNER	Crystal Lake	10	5.19	.0017	.0139	.0017	.31	1.8
GLOUCESTER	Dike's Brook Reservoir	47	4.50	.0034	.0128	.0016	.87	0.5
	Wallace Reservoir	59	4.98	.0030	.0176	.0037	.96	0.8
	Haskell Brook Reservoir	09	4.09	.0011	.0097	.0029	.81	0.7
Great Barrington (Fire District)	East Mountain Reservoir	09	5.32	.0011	.0075	.0012	.10	3.3
Great Barrington (Housatonic)	Long Pond	02	7.83	.0024	.0158	.0013	.13	6.6
Greenfield	Glen Brook Upper Reservoir	04	6.22	.0010	.0041	.0011	.16	3.6
	Glen Brook Lower Reservoir	09	5.98	.0015	.0050	.0017	.15	3.1
Hadley (Water Supply District)	Hart's Brook Reservoir	12	4.92	.0000	.0042	.0006	.18	2.2
Hatfield	Running Gutter Brook Reservoir	09	6.22	.0000	.0044	.0002	.20	2.5
HAVERHILL	Johnson's Pond	19	5.60	.0017	.0171	.0030	.43	2.3

Averages of Chemical Analyses of Surface-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus-pended.		
HAVERHILL (cont.)	Crystal Lake	.22	3.89	.0010	.0159	.0029	.32	1.4
	Kenoza Lake	.18	5.05	.0016	.0167	.0035	.40	2.2
	Lake Saltonstall	.09	6.46	.0050	.0181	.0032	.61	2.9
	Pentucket Lake	.15	4.67	.0010	.0161	.0025	.38	1.9
	Millvale Reservoir	.68	5.60	.0027	.0211	.0030	.38	1.9
Hingham	Accord Pond	.20	3.76	.0010	.0111	.0011	.55	0.7
	Fulling Mill Pond	.33	5.63	.0098	.0264	.0099	.71	1.6
Hinsdale (Fire District)	Reservoir	.06	2.57	.0010	.0063	.0007	.09	0.7
HOLYOKE	Whiting Street Reservoir	.09	5.83	.0026	.0142	.0027	.23	2.9
	Fomer Reservoir	.22	3.98	.0023	.0159	.0021	.16	1.4
	Wright and Ashley Pond	.09	5.74	.0015	.0134	.0025	.17	3.1
	High Service Reservoir	.11	4.41	.0009	.0122	.0022	.16	1.8
	White Reservoir	.16	3.96	.0012	.0129	.0022	.14	1.4
Hudson	Gates Pond	.10	3.76	.0011	.0172	.0033	.24	1.4
Huntington (Fire Dis- trict)	Cold Brook Reservoir	.10	3.47	.0004	.0039	.0004	.12	1.1
	Dow's Brook Reservoir	.28	5.45	.0040	.0176	.0036	.59	2.1
Ipswich	Merrimack River, filtered	.38	5.38	.0052	.0086	-	.51	2.0
LAWRENCE	Codding Brook Upper Reservoir	.11	4.01	.0003	.0063	.0015	.10	1.7
	Codding Brook Lower Reservoir	.11	4.34	.0006	.0058	.0012	.09	1.9
Lenox	Basin Pond Brook	.42	3.95	.0004	.0095	.0013	.11	1.5
	Lower Root Reservoir	.02	7.75	.0017	.0064	.0018	.10	6.0
	Woolsey Reservoir	.03	6.89	.0020	.0092	.0022	.09	4.7
	Laurel Lake	.08	10.37	.0019	.0134	.0025	.13	9.6
	Morse Reservoir	.14	2.97	.0031	.0121	.0023	.16	0.4
LEOMINSTER	Haynes Reservoir	.15	2.98	.0035	.0150	.0020	.17	0.6
	Fall Brook Reservoir	.12	3.18	.0028	.0119	.0022	.18	0.5
Lincoln	Sandy Pond	.02	3.57	.0008	.0080	.0009	.29	0.9
Longmeadow	Cooley Brook	.08	5.80	.0050	.0083	.0012	.26	2.6
LYNN	Birch Reservoir	.10	5.27	.0076	.0150	.0024	.81	2.0
	Breed's Reservoir	.40	6.63	.0043	.0184	.0030	.76	2.3
	Walden Reservoir	.48	6.63	.0037	.0202	.0036	.79	2.6
	Hawkes Reservoir	.55	6.91	.0067	.0220	.0031	.77	2.7
	Gravel Pond	.12	4.43	.0012	.0148	.0017	.76	1.2
MARLBOROUGH	Lake Williams	.10	6.14	.0035	.0217	.0045	.68	2.1
	Millham Brook Reservoir	.56	5.57	.0051	.0183	.0026	.42	1.7
Maynard	White Pond	.08	3.21	.0013	.0113	.0017	.25	0.9
Milford	Charles River, filtered	.16	5.80	.0006	.0048	-	.31	2.6
Montague	Lake Pleasant	.05	3.08	.0006	.0066	.0009	.15	0.9
Nantucket	Wannacomet Pond	.10	8.38	.0020	.0197	.0058	2.48	1.7
NEW BEDFORD	Little Quittacas Pond	.31	4.30	.0024	.0159	.0020	.49	1.0
	Great Quittacas Pond	.52	4.24	.0018	.0171	.0018	.50	0.8
NEWBURYPORT	Artichoke River	.44	9.25	.0079	.0336	.0067	.56	4.0
NORTH ADAMS	Notch Brook Reservoir	.04	7.12	.0011	.0030	.0004	.09	5.7
	Broad Brook	.19	4.25	.0030	.0087	.0015	.09	1.9
NORTHAMPTON	Mount Williams Reservoir	.02	7.02	.0008	.0054	.0006	.08	5.1
	Middle Reservoir	.22	4.53	.0010	.0096	.0017	.16	1.7
North Andover	Mountain Street Reservoir	.07	3.99	.0007	.0061	.0012	.11	1.8
	Great Pond	.21	5.06	.0022	.0163	.0025	.42	1.9
Northborough	Lower Reservoir	.67	4.64	.0027	.0187	.0019	.25	1.1
	Upper Reservoir	.68	4.65	.0026	.0185	.0044	.24	1.1
North Brookfield	Doane Pond	.46	3.64	.0032	.0240	.0054	.19	0.8
	North Pond	.46	4.16	.0039	.0269	.0048	.19	0.7
Northfield	Reservoir	.21	3.87	.0003	.0049	.0007	.11	0.9
Norwood	Buckmaster Pond	.15	4.58	.0035	.0172	.0043	.45	1.6
Orange	Reservoir	.03	3.23	.0006	.0018	.0001	.13	0.9
Palmer (Fire District No. 1)	Lower Reservoir	.19	3.87	.0009	.0129	.0014	.19	1.0
PEABODY	Spring Pond	.22	5.95	.0033	.0177	.0042	.76	1.9
	Suntaug Lake	.40	5.97	.0082	.0230	.0051	.82	1.8
PITTSFIELD	Ashley Lake	.18	6.33	.0015	.0088	.0012	.12	4.3
	Ashley Brook	.13	5.93	.0009	.0077	.0008	.12	4.1
	Hathaway Brook	.11	7.82	.0006	.0064	.0014	.11	6.4
	Mill Brook	.35	4.34	.0051	.0158	.0016	.11	1.9
	Sacket Brook	.13	6.91	.0009	.0060	.0016	.10	5.3
Plymouth	Farnham Reservoir	.48	4.22	.0055	.0199	.0029	.09	1.4
	Little South Pond	.01	3.08	.0009	.0134	.0021	.66	0.3
	Great South Pond	.00	3.30	.0015	.0119	.0019	.64	0.4
Randolph	Great Pond	.41	5.74	.0025	.0169	.0020	.71	1.3
Rockport	Cape Pond	.50	8.59	.0007	.0225	.0044	2.78	1.6
Russell	Black Brook	.19	3.66	.0002	.0049	.0004	.11	1.2
Rutland	Muschopauge Lake	.09	3.75	.0006	.0111	.0030	.34	1.4
SALEM	Wenham Lake	.44	7.27	.0053	.0203	.0026	.91	2.5
	Longham Reservoir	1.36	7.42	.0105	.0322	.0050	.93	1.9
Shelburne (Shelburne Falls Fire District)	Ipswich River at pumping sta- tion	1.57	12.77	.0116	.0352	.0092	.76	5.2
	Fox Brook	.02	5.17	.0004	.0022	-	.10	2.8

Averages of Chemical Analyses of Surface-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.	Sus-pended.		
					Total.			
Southbridge	Hatchet Brook Reservoir No. 3	.20	3.49	.0009	.0120	.0017	.19	0.9
	Hatchet Brook Reservoir No. 4	.21	3.27	.0007	.0137	.0025	.18	0.9
South Hadley (Fire District No. 1)	Leaping Well Reservoir	.09	3.20	.0006	.0091	.0022	.19	1.0
	Buttery Brook Reservoir	.31	5.14	.0040	.0148	.0058	.36	1.6
Spencer	Shaw Pond	.09	3.12	.0011	.0108	.0013	.20	0.9
SPRINGFIELD	Westfield Little River, filtered	.16	3.95	.0004	.0046	-	.13	1.2
Stockbridge	Lake Averic	.14	7.10	.0016	.0115	.0017	.10	4.6
Stoughton	Muddy Pond Brook	.35	5.17	.0008	.0083	.0007	.34	1.1
TAUNTON	Assawompsett Pond	.40	4.10	.0022	.0168	.0021	.47	0.7
	Elder's Pond	.14	3.71	.0014	.0140	.0014	.47	0.8
Wakefield	Crystal Lake	.16	7.74	.0034	.0125	.0018	.96	3.3
Wareham (Onset)	Jonathan Pond	.04	2.98	.0007	.0095	.0010	.65	0.5
Wayland	Snake Brook Reservoir	.81	5.16	.0044	.0205	.0024	.31	1.6
WESTFIELD	Montgomery Reservoir	.40	3.42	.0031	.0153	.0026	.15	0.6
	Tillotson Brook Reservoir	.08	3.29	.0008	.0044	.0007	.13	0.9
West Springfield	Bear Hole Brook	.10	7.64	.0039	.0080	.0013	.19	4.5
	Bear Hole Brook, filtered	.03	7.42	.0003	.0025	-	.18	4.5
West Stockbridge	East Mountain Reservoir	.04	5.53	.0002	.0017	.0001	.13	2.7
Weymouth	Great Pond	.77	4.28	.0011	.0164	.0035	.46	1.0
Williamsburg	Reservoir	.15	4.37	.0005	.0095	.0039	.13	1.9
Williamstown	Rattlesnake Brook	.04	8.37	.0005	.0067	.0014	.09	6.9
	Paul Brook	.00	6.40	.0006	.0023	.0001	.08	4.3
Winchester	North Reservoir	.06	4.43	.0012	.0105	.0018	.41	1.8
	South Reservoir	.04	3.93	.0015	.0114	.0017	.37	1.6
	Middle Reservoir	.12	4.25	.0032	.0211	.0037	.39	1.5
WORCESTER	Bottomly Reservoir	.50	5.74	.0022	.0162	.0025	.29	1.8
	Kent Reservoir	.24	4.35	.0014	.0140	.0018	.24	1.6
	Leicester Reservoir	.21	4.31	.0023	.0151	.0033	.24	1.4
	Mann Reservoir	.25	4.39	.0012	.0140	.0020	.23	1.5
	Upper Holden Reservoir	.19	3.57	.0013	.0117	.0018	.21	1.0
	Lower Holden Reservoir	.14	3.43	.0009	.0105	.0016	.20	1.0
	Kendall Reservoir	.10	3.39	.0009	.0121	.0019	.22	1.3
	Pine Hill Reservoir	.31	4.10	.0097	.0180	.0031	.25	1.2

Averages of Chemical Analyses of Ground-Water Sources for the Year 1928.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albu-minoid.		Nitrates.	Nitrites.		
Acton (West and South Water Supply District)	Tubular wells	.00	8.29	.0004	.0018	.44	.0980	.0000	3.3	.006
Adams (Fire District)	Tubular wells	.00	13.50	.0000	.0006	.11	.0500	.0040	10.2	.005
Amesbury	Tubular wells	.48	15.32	.0090	.0044	.48	.0063	.0000	7.1	.523
	Tubular wells, filtered	.08	13.13	.0005	.0034	.48	.0028	.0000	7.0	.024
Ashland	Tubular wells, new supply	.02	5.18	.0006	.0015	.38	.0037	.0000	2.0	.026
ATTLEBORO	Wells	.05	5.67	.0005	.0130	.44	.0070	.0000	2.0	.014
Auburn	Tubular wells	.00	8.37	.0003	.0012	.55	.1357	.0001	3.8	.005
Avon	Wells	.00	7.42	.0000	.0012	.56	.1850	.0000	2.5	.005
Ayer	Large well	.01	8.90	.0008	.0014	1.08	.0495	.0000	3.6	.007
	Tubular wells	.18	7.52	.0011	.0011	.29	.0035	.0000	3.2	.022
Barnstable	Tubular wells	.01	4.35	.0013	.0011	1.12	.0013	.0000	0.9	.023
Bedford	Large well	.00	4.59	.0093	.0013	.36	.0110	.0000	1.7	.005
Belchertown	Tubular wells	.00	7.12	.0002	.0009	.41	.0050	.0000	2.4	.008
Billerica	Wells	.39	8.82	.0017	.0082	.38	.0102	.0000	3.6	.037
Blackstone	Tap (supply from Woonsocket, R. I.)	.15	16.85	.0007	.0064	1.88	.4427	.0001	8.4	.027
Bridgewater	Wells	.00	6.25	.0009	.0013	.57	.0643	.0000	1.5	.008
Brookline	Tubular wells and filter-gallery, filtered	.11	9.43	.0005	.0052	.66	.0153	.0000	3.9	.008
Canton	Springdale well	.03	6.10	.0002	.0015	.57	.0310	.0000	2.0	.006
	Well near Henry's Spring	.05	6.02	.0002	.0022	.59	.0547	.0000	2.0	.006
	Ward well	.03	6.62	.0002	.0015	.44	.0064	.0000	2.4	.011
Chelmsford (North Chelmsford Fire District)	Tubular wells	.11	6.20	.0119	.0073	.50	.1120	.0002	2.2	.025

Averages of Chemical Analyses of Ground-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Alb.-minoid.		Nitrates.	Nitrites.		
Chelmsford (Water District)	Tubular wells	.05	9.25	.0002	.0010	.63	.1550	.0000	3.3	.028
Cohasset	Tubular wells	.06	13.65	.0004	.0038	1.86	.1750	.0000	5.3	.006
	Dug well, filtered	.29	7.70	.0039	.0088	.98	.0037	.0001	2.3	.026
Cummington	Tubular wells	.05	6.60	.0003	.0013	.10	.0020	.0000	3.8	.024
Dedham	Large well and tubular wells	.12	10.01	.0025	.0037	.91	.1258	.0001	3.8	.027
Deerfield (Fire District)	Wells	.00	5.52	.0003	.0011	.14	.0020	.0000	2.4	.008
Douglas	Tubular wells	.00	6.11	.0006	.0008	.38	.0870	.0000	2.0	.011
Dracut (Water Supply District)	Tubular wells	.05	11.35	.0008	.0012	.74	.1900	.0001	5.1	.018
Dracut (Collinsville)	Tubular wells	.03	6.07	.0000	.0013	.44	.0377	.0000	1.9	.015
Dudley	Tubular wells	.01	4.82	.0004	.0021	.26	.0030	.0000	1.2	.008
Dunstable	Well	.01	5.50	.0001	.0012	.20	.0043	.0000	2.2	.030
Duxbury (Fire and Water District)	Tubular wells	.00	4.53	.0000	.0005	.72	.0037	.0000	0.8	.007
East Brookfield	Tubular wells	.01	4.00	.0002	.0013	.25	.0010	.0000	1.0	.007
Easthampton	Tubular wells	.00	7.13	.0002	.0008	.15	.0073	.0000	4.1	.005
Easton (North Easton Village District)	Well	.10	6.82	.0020	.0037	.50	.0935	.0001	2.5	.036
Edgartown	Large well	.00	4.30	.0001	.0009	.95	.0023	.0000	0.5	.004
Fairhaven	Old wells	.37	7.87	.0008	.0077	1.05	.0518	.0000	2.7	.019
	New wells	.00	6.35	.0000	.0016	.93	.1075	.0000	1.9	.005
Foxborough (Water Supply District)	Tubular wells	.00	5.85	.0006	.0009	.45	.0450	.0000	1.8	.009
Frammingham	Filter-gallery	.01	13.41	.0225	.0060	2.19	.0246	.0002	5.2	.012
Franklin	Tubular wells	.01	5.50	.0002	.0017	.49	.0090	.0000	1.7	.011
Grafton	Filter-gallery	.04	12.90	.0003	.0024	1.53	.1792	.0000	4.7	.004
Granville	Well	.01	3.60	.0000	.0015	.12	.0017	.0000	1.3	.009
Great Barrington	Well near Green River	.00	8.99	.0007	.0050	.09	—	—	6.4	.005
	Filter-gallery near Green River	.01	9.00	.0002	.0024	.09	—	—	6.4	.007
Greenfield	Well near Green River	.06	5.30	.0001	.0013	.14	.0023	.0000	3.3	.007
Groton	Large well	.00	6.80	.0013	.0020	.22	.0023	.0000	3.4	.004
Groton (West Groton Water Supply District)	Tubular wells	.03	5.27	.0001	.0010	.19	.0032	.0002	3.2	.015
Hingham	Wells	.15	5.54	.0022	.0051	.66	.0084	.0000	1.7	.011
Holliston	Large well	.36	4.74	.0023	.0127	.35	.0031	.0000	1.5	.028
Hopkinton	Tubular wells	.03	9.97	.0003	.0021	.75	.0951	.0000	3.8	.008
Kingston	Tubular wells	.00	4.73	.0000	.0005	.65	.0043	.0000	1.2	.007
Leicester (Water Supply District)	Wells	.01	5.83	.0021	.0011	.28	.0697	.0002	2.7	.006
Leicester (Cherry Valley and Rochdale Water District)	Wells	.26	5.37	.0040	.0127	.31	.0040	.0000	2.0	.015
Littleton	Tubular wells	.00	4.77	.0001	.0010	.21	.0047	.0000	1.9	.005
LOWELL	Boulevard wells (tubular)	.66	7.07	.0440	.0058	.42	.0190	.0002	2.4	.299
	Boulevard wells, filtered	.05	5.86	.0007	.0026	.42	.0367	.0000	2.2	.014
Manchester	Wells	.02	10.12	.0003	.0025	1.58	.1044	.0000	3.3	.020
Mansfield (Water Supply District)	Large well	.00	4.50	.0002	.0011	.29	.0095	.0000	1.4	.007
Marblehead	Inlet of filter	.36	16.72	.0090	.0112	1.89	.0053	.0000	7.1	.185
	Outlet of filter	.22	18.68	.0006	.0092	1.43	.0047	.0000	9.5	.029
	Well	.16	20.62	.0004	.0058	2.91	.0150	.0000	10.2	.024
Marion	Old wells	.00	5.07	.0000	.0009	.69	.0245	.0000	1.6	.006
	New wells	.00	8.20	.0001	.0010	1.71	.0310	.0000	3.3	.007
Marshfield	Tubular wells at Humarock Beach	.00	8.85	.0005	.0013	2.14	.0365	.0001	1.9	.006
Mattapoisett	Tubular wells	.00	6.47	.0001	.0012	.80	.0247	.0000	2.3	.005
Medfield	Spring	.01	4.50	.0008	.0031	.30	.0097	.0000	1.5	.005
Medway	Wells	.02	7.78	.0036	.0020	.64	.0478	.0000	2.8	.011
Merrimac	Tubular wells	.00	9.17	.0003	.0008	.53	.0265	.0000	3.2	.016
Methuen	Tubular wells at Harris Brook	.70	7.40	.0046	.0149	.48	.0112	.0000	2.5	.106
	Tubular wells at Pine Island	.00	9.61	.0002	.0011	.86	.2417	.0002	3.6	.013
Middleborough (Fire District)	Well	.26	7.15	.0093	.0048	.62	.0395	.0001	2.5	.347
	Filtered water	.28	7.25	.0102	.0039	.62	.0377	.0001	2.4	.213
Millbury	Well	.00	5.05	.0003	.0017	.36	.0180	.0000	2.0	.005
Millis	Spring	.00	12.07	.0003	.0009	.93	.2790	.0000	5.8	.006
Monson	Old well	.09	4.00	.0001	.0022	.19	.0022	.0000	1.0	.006
	New well	.00	3.85	.0004	.0025	.18	.0022	.0000	0.9	.005

Averages of Chemical Analyses of Ground-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albu- minoid.		Nitrates.	Nitrites.		
Monterey	Springs	.07	8.33	.0004	.0038	.12	—	—	6.7	.005
Nantucket	Wells at Wyers Val- ley	.00	5.10	.0000	.0005	1.88	.0023	.0000	1.6	.005
Natick	Large well	.00	11.55	.0002	.0013	1.04	.0523	.0000	5.6	.006
Needham	Wells	.00	10.12	.0002	.0013	.91	.2933	.0000	3.3	.006
	Hicks Spring	.02	12.91	.0003	.0016	1.20	.5333	.0000	3.9	.005
NEWBURYPORT	Wells and Artichoke River, filtered	.12	6.80	.0005	.0097	.59	.0215	.0000	2.6	.021
NEWTON	Tubular wells and filter-gallery	.05	8.46	.0010	.0026	.56	.0265	.0000	3.9	.019
North Attleborough	Wells	.01	6.95	.0011	.0022	.52	.0225	.0000	2.6	.012
Northbridge	Tubular wells	.00	4.08	.0002	.0011	.26	.0042	.0000	1.2	.008
Norton	Tubular wells	.00	4.43	.0000	.0010	.30	.0020	.0000	1.3	.010
Norwood	Tubular wells	.11	8.57	.0016	.0030	.62	.0552	.0000	3.6	.087
Oak Bluffs	Springs	.00	4.43	.0006	.0025	.91	.0037	.0000	0.6	.005
Oxford	Tubular wells	.00	5.63	.0000	.0006	.34	.0380	.0000	2.0	.005
Palmer (Bondsville)	Tubular wells	.00	6.77	.0001	.0008	.26	.0340	.0000	2.2	.022
Pepperell	Tubular wells	.00	3.93	.0003	.0011	.16	.0027	.0000	1.4	.006
Provincetown	Tubular wells	.00	8.00	.0001	.0005	2.66	.0032	.0000	1.5	.007
Reading	Filter-gallery	1.82	9.60	.0197	.0293	1.08	.0127	.0000	2.4	.366
	Tap in pumping station	.23	14.63	.0095	.0076	1.01	.0027	.0000	6.2	.053
Salisbury	Old well	.13	8.93	.0001	.0031	.56	.0027	.0000	3.3	.013
	New well	.19	9.98	.0001	.0009	.53	.0018	.0000	5.2	.059
Scituate	Beaver Dam wells	.36	12.47	.0016	.0098	2.26	.1307	.0005	3.8	.026
	Webster Meadow wells	.00	9.53	.0002	.0007	1.21	.0413	.0001	3.3	.010
Sharon	Well	.00	19.30	.0003	.0014	3.22	.4275	.0000	10.0	.008
	Tubular wells	.00	5.87	.0001	.0010	.53	.0422	.0000	2.0	.005
Sheffield	Spring	.00	3.93	.0001	.0013	.12	.0017	.0001	1.5	.005
Shirley (Shirley Village Water District)	Well	.00	4.60	.0001	.0006	.35	.1375	.0000	1.2	.008
Shrewsbury	Tubular wells	.04	5.45	.0002	.0026	.40	.0292	.0000	1.8	.008
Somerset	Tubular wells	.01	6.96	.0002	.0010	.50	.0066	.0000	2.2	.007
South Hadley (Fire District No. 2)	Large well	.00	4.32	.0002	.0016	.15	.0093	.0000	1.8	.004
Sunderland	Springs	.02	6.77	.0006	.0018	.14	—	—	3.6	.018
Tisbury	Well	.00	4.00	.0006	.0010	.97	.0020	.0000	0.6	.005
Uxbridge	Tubular wells	.00	6.37	.0007	.0017	.49	.0937	.0000	2.3	.007
Walpole	Tubular wells	.00	6.50	.0002	.0022	.39	.0550	.0000	2.2	.008
WALTHAM	Old well	.21	8.86	.0059	.0027	.73	.0108	.0000	4.0	.121
	New well	.01	8.02	.0006	.0022	.57	.0149	.0000	3.5	.011
Ware	Wells	.00	8.8	.0002	.0011	.66	.1914	.0000	3.2	.006
	Large well	.00	8.44	.0002	.0013	.62	.1814	.0000	3.0	.005
Wareham (Fire District)	Tubular wells	.00	3.87	.0001	.0010	.57	.0020	.0000	1.2	.006
Warren	Tubular wells	.01	4.12	.0002	.0008	.24	.0195	.0000	1.1	.005
Wayland	Wells	.03	7.76	.0005	.0011	.45	.1010	.0004	3.2	.018
Webster	Wells	.00	5.53	.0011	.0011	.37	.0107	.0000	1.9	.006
Wellesley	Tubular wells	.01	9.02	.0002	.0014	.92	.0702	.0000	4.0	.013
	Well at Williams Spring	.00	13.90	.0008	.0019	1.25	.5700	.0000	5.3	.004
	Filter-gallery	.01	10.13	.0008	.0035	1.05	.1518	.0000	4.2	.007
Westborough	Filter basin	.00	3.54	.0006	.0076	.28	—	—	1.2	.010
West Brookfield	Tubular wells	.00	5.10	.0010	.0013	.21	.0037	.0000	1.4	.003
Westford	Tubular wells	.03	5.20	.0004	.0008	.21	.0025	.0000	2.2	.014
Weston	Well at Warren Ave.	.15	7.85	.0012	.0052	.55	.0522	.0000	3.2	.014
	Tubular wells at Kendal Green	.00	7.55	.0001	.0017	.86	.0890	.0000	3.3	.011
West Stockbridge	Johnson's Spring	.00	8.28	.0002	.0011	.09	.0020	.0000	5.3	.007
Williamstown	Cold Spring	.00	12.85	.0004	.0009	.07	—	—	14.5	.008
	Sherman Spring	.02	7.80	.0003	.0022	.08	—	—	6.4	.006
Winchendon	Old wells	.09	4.22	.0014	.0039	.15	.0030	.0000	1.3	.027
	New wells	.22	3.82	.0020	.0053	.14	.0042	.0000	0.9	.006
WOBURN	Filter-gallery	.03	9.68	.0014	.0052	1.08	.0032	.0002	4.5	.006
Worthington (Fire District)	Springs	.03	3.53	.0001	.0011	.10	.0040	.0000	1.6	.007
Wrentham	Tubular wells	.00	5.23	.0003	.0008	.35	.0070	.0000	1.9	.006

CONSUMPTION OF WATER.

The quantity of water consumed in the various cities and towns in the State where records have been maintained during the year 1928 is shown in the following table. The estimates of population given in the table have been deduced from a comparison of the census records for the years 1920 and 1925. The apparently excessive consumption of water in some of the cities and towns is due in many cases either to the use of large quantities of water for manufacturing pur-

poses or to the fact that the town is a summer resort having a large additional population during the summer season, as for example the towns of Scituate, Nahant, etc. The remarkably low per capita consumption shown in other cases, as for example in Acushnet, Agawam, Dartmouth, etc., is due to the fact that only portions of these towns are as yet supplied with water from the public works, though the per capita consumption is based on the entire population of the town.

Average Daily Consumption of Water in Various Cities and Towns in 1928.

CITY OR TOWN.	Esti- mated Popu- lation.	Gallons.	Gallons per Inhabit- ant.	CITY OR TOWN.	Esti- mated Popu- lation.	Gallons.	Gallons per Inhabit- ant.
Metropolitan Water				Greenfield	15,246	1,472,000	97
District	1,360,720	135,693,000	100	Groton	2,574	264,000	103
Arlington	28,711	1,718,000	60	Groveland	2,485	53,000	21
Belmont	17,959	1,097,000	60	HAVERHILL	49,232	4,298,000	87
Boston	798,556	94,570,000	118	Holliston	2,875	105,000	37
CHELSEA	49,686	3,619,000	73	HOLYOKE	60,414	7,204,000	119
EVERETT	43,244	5,039,000	117	Hudson	8,444	428,000	51
Lexington	8,646	638,000	74	Ipsewich	6,055	225,000	37
MALDEN	53,400	3,447,000	65	Kingston	2,536	250,000	99
MEDFORD	52,781	2,903,000	55	Lancaster	2,808	104,000	37
MELROSE	21,341	1,420,000	67	LAWRENCE	93,527	4,563,000	49
Milton	14,949	740,000	50	Lenox	3,017	300,000	99
Nahant	1,816	171,000	94	Lincoln	1,464	252,000	172
QUINCY	67,363	5,196,000	77	Littleton	1,491	78,000	52
REVERE	35,925	2,272,000	63	Longmeadow	3,762	189,000	50
SOMERVILLE	102,596	8,308,000	81	LOWELL	110,296	5,394,000	49
Stoneham	9,810	568,000	58	Ludlow	9,601	185,000	19
Swanipscott	9,463	707,000	75	LYNN	105,441	8,533,000	81
Watertown	27,895	2,230,000	80	Manchester	2,519	255,000	101
Winthrop	16,581	1,071,000	65	Mansfield	6,791	480,000	71
Abington and Rock- land	14,158	581,000	41	Marblehead	8,748	629,000	72
Acton	2,522	90,000	36	Marion	1,271	138,000	109
Acushnet	4,771	88,000	18	MARLBOROUGH	16,961	655,000	39
Adams	10,860	1,333,000	96	Mattapoisett	1,723	85,000	49
Agawam	7,050	111,000	16	Maynard	8,320	290,000	35
Amesbury	11,945	726,000	61	Medfield	4,030	77,000	19
Amherst	6,225	601,000	97	Medway	3,258	159,000	49
Andover	11,505	852,000	74	Merrimac	2,454	122,000	50
Ashburnham	2,247	78,000	35	Methuen	23,855	1,111,000	47
Athol	9,602	707,000	74	Middleborough	9,547	267,000	28
ATTLEBORO	21,158	1,139,000	54	Milford	18,966	831,000	44
Avon	2,470	117,000	47	Millbury	6,915	404,000	58
Ayer	3,032	172,000	57	Millis	1,974	129,000	65
Barnstable	6,337	295,000	47	Montague	9,509	804,000	85
Bedford	1,605	77,000	48	Nantucket	3,365	421,000	125
BEVERLY	22,759	1,374,000	60	Natick	14,050	729,000	52
Billerica	5,673	279,000	48	Needham	10,156	622,000	61
Braintree	14,761	1,191,000	81	NEW BEDFORD	119,539	7,987,000	67
Bridgewater	10,086	226,000	22	NEWBURYPORT	15,680	1,332,000	85
BROCKTON	65,343	2,960,000	45	NEWTON	57,173	4,360,000	76
Brookline	45,654	4,393,000	92	NORTH ADAMS	22,971	1,136,000	49
CAMBRIDGE	125,654	12,156,000	97	North Andover	7,184	429,000	60
Canton	5,896	504,000	85	North Attleborough	10,120	723,000	71
Chelmsford	7,108	178,000	25	Northbridge	10,051	576,000	57
CHICOPEE	45,283	2,737,000	60	North Brookfield	3,307	346,000	105
Clinton	14,901	836,000	56	Norwood	15,066	1,139,000	76
Cohasset	3,077	316,000	103	Orange	5,141	169,000	33
Concord	7,413	631,000	85	PEABODY	20,062	3,106,000	155
Danvers and Middle- ton	14,162	1,344,000	95	Pepperell	2,965	136,000	46
Dartmouth	10,546	127,000	12	PITTSFIELD	49,946	6,235,000	125
Dedham	15,794	786,000	50	Plainville	1,599	99,000	62
Douglas	2,472	26,000	11	Plymouth	13,254	1,336,000	101
Dracut	7,072	128,000	18	Provincetown	3,787	285,000	75
Dudley	5,130	159,000	31	Randolph and Hol- brook	9,517	543,000	57
Duxbury	1,769	159,000	90	Reading	9,446	360,000	38
East Bridgewater	3,569	145,000	41	Rockport	3,991	267,000	67
East Brookfield	958	41,000	43	SALEM	42,995	5,232,000	122
Easthampton	11,783	836,000	71	Salisbury	1,892	186,000	98
East Longmeadow	3,603	48,000	13	Saugus	13,865	740,000	53
Easton	5,508	228,000	41	Scituate	2,821	417,000	148
Edgartown	1,262	132,000	105	Sharon	3,509	218,000	62
FALL RIVER	134,098	6,425,000	48	Shirley	2,475	60,000	24
Falmouth	5,410	562,000	104	Shrewsbury	7,085	249,000	35
FITCHBURG	45,157	3,951,000	88	Southbridge	16,236	723,000	45
Foxborough	5,413	482,000	89	SPRINGFIELD	149,535	14,600,000	98
Framingham	23,505	1,474,000	63	Stockbridge	1,869	209,000	112
Franklin	7,390	454,000	61	Stoughton	8,451	477,000	56
GARDNER	19,785	837,000	42	TAUNTON	40,527	2,905,000	72
GLOUCESTER	23,632	1,759,000	74	Tisbury	1,524	203,000	133
Grafton	7,025	110,000	16	Uxbridge	6,646	335,000	50
				Wakefield	17,162	662,000	39

Average Daily Consumption of Water in Various Cities and Towns in 1928.
— Concluded.

CITY OR TOWN.	Esti- mated Popu- lation.	Gallons.	Gallons per Inhabit- ant.	CITY OR TOWN.	Esti- mated Popu- lation.	Gallons.	Gallons per Inhabit- ant.
Walpole	7,144	769,000	108	WESTFIELD	19,786	1,709,000	86
WALTHAM	37,044	2,346,000	63	Westford	3,811	167,000	44
Ware	8,692	326,000	38	Weston	3,281	181,000	55
Wareham	6,302	243,000	39	West Springfield	16,457	2,242,000	136
Warren	4,241	60,000	14	Weymouth	18,570	1,118,000	62
Webster	13,467	612,000	45	Whitman	8,283	296,000	36
Wellesley	10,744	761,000	71	Woburn	19,447	1,323,000	68
West Bridgewater	3,250	133,000	41	WORCESTER	197,360	15,895,000	81
West Brookfield	1,335	66,000	49	Wrentham	3,457	118,000	34

RAINFALL.

The following table shows the normal rainfall in the State as deduced from records at eight widely distributed stations with long-term records, also the rainfall for the year 1928, and the excess or deficiency of precipitation in each month as compared with the normal.

MONTH.	Normal Rainfall (Inches).	Rainfall in 1928 (Inches).	Excess or Deficiency in 1928 (Inches).	MONTH.	Normal Rainfall (Inches).	Rainfall in 1928 (Inches).	Excess or Deficiency in 1928 (Inches).
January	3.76	2.58	-1.18	August	4.19	4.32	+0.13
February	3.63	3.39	-0.24	September	3.45	4.18	+0.73
March	3.90	2.07	-1.83	October	3.67	2.72	-0.95
April	3.67	4.97	+1.30	November	3.90	2.17	-1.73
May	3.56	2.53	-1.03	December	3.70	2.50	-1.20
June	3.31	6.00	+2.69	Totals	44.51	42.46	-2.05
July	3.77	5.03	+1.26				

FLOW OF STREAMS.

Sudbury River.

The average yield of the Sudbury River in the year 1928 was 1,105,000 gallons per day per square mile of drainage area. The normal flow of this river for the 54 years during which records have been maintained is 980,000 gallons per square mile per day. The average daily yield for the six driest months, July to December, inclusive, was 721,000 gallons per square mile, or 82.1 per cent above the normal.

The following table shows the relation between the average daily yield of the Sudbury River per square mile in each month in the year 1928 and the normal yield of the river during the past 54 years. The drainage area of the river at the point of measurement is 75.2 square miles.

Table showing the Average Daily Yield of the Sudbury River for Each Month in the Year 1928, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1928.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.738	1.124	2.019	1.305	+ .281	+ .181
February	2.402	1.553	2.546	1.645	+ .144	+ .092
March	4.137	2.674	1.972	1.275	-2.165	-1.399
April	3.037	1.963	2.723	1.760	- .314	- .203
May	1.702	1.100	2.188	1.414	+ .486	+ .314
June . . . . .	.800	.517	2.453	1.585	+1.653	+1.068
July . . . . .	.336	.217	1.882	1.217	+1.546	+1.000
August . . . . .	.363	.235	.851	.550	+ .488	+ .315
September . . . . .	.382	.247	.918	.594	+ .536	+ .347
October . . . . .	.606	.392	.814	.526	+ .208	+ .134
November	1.205	.779	.912	.589	- .293	- .190
December	1.537	.994	1.301	.841	- .236	- .153
Average for whole year	1.516	.980	1.710	1.105	+ .194	+ .125

The rainfall on the Sudbury River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1923 to 1928, inclusive, together with the average for a period of fifty-four years, are given in the following table:

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area.

MONTH.	1923.			1924.			1925.			1926.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	7.64	2.779	36.4	3.60	3.205	89.1	4.47	.328	7.4	3.00	1.539	51.2
February	2.31	1.507	65.3	2.56	1.193	46.7	2.20	2.985	136.0	5.92	1.596	27.0
March	3.25	5.659	173.9	2.66	3.462	130.0	5.69	3.895	68.4	3.23	4.863	150.6
April	5.35	4.197	78.4	5.49	5.268	96.1	2.95	2.570	87.2	2.21	3.323	150.5
May	1.01	2.099	207.3	3.22	2.495	77.6	2.45	1.036	42.2	2.29	1.284	56.1
June	4.12	0.668	16.2	1.49	.485	32.5	4.75	.374	7.9	1.60	.179	11.2
July	2.94	0.118	4.0	3.19	-0.094	-2.9	5.35	.427	8.0	3.18	-.122	-3.8
August	2.17	-0.130	-6.0	4.73	0.207	4.4	1.25	.102	8.2	5.51	.415	7.5
September	1.54	-0.099	-6.5	5.67	0.706	12.4	3.19	.068	2.1	1.40	-.196	-14.0
October	5.71	0.707	12.4	0.11	0.011	10.0	4.41	.626	14.2	3.77	.203	5.4
November	5.83	1.969	33.8	2.51	0.286	11.4	3.17	1.001	31.6	5.27	1.386	26.3
December	4.96	3.921	79.1	1.73	0.489	28.4	5.76	3.330	57.8	4.03	1.195	29.7
Totals and averages	46.83	23.395	50.0	36.96	17.713	47.9	45.64	16.742	36.7	41.41	15.665	37.8

MONTH.	1927.			1928.			MEAN FOR FIFTY-FOUR YEARS, 1875-1928.		
	Rain- fall.	Rain- fall col- lected.	Per Cent col- lected.	Rain- fall.	Rain- fall col- lected.	Per Cent col- lected.	Rain- fall.	Rain- fall col- lected.	Per Cent col- lected.
January	2.91	2.313	79.5	2.69	2.328	86.7	3.96	2.004	50.6
February	3.71	2.355	63.5	3.62	2.746	75.9	4.05	2.523	62.4
March	1.43	3.664	256.6	1.96	2.274	116.3	4.18	4.770	114.2
April	2.24	1.194	53.3	5.44	3.035	55.7	3.62	3.388	93.7
May	2.97	1.369	46.1	2.47	2.523	102.4	3.24	1.962	60.6
June	1.99	.370	18.6	6.36	2.736	43.0	3.30	.892	27.1
July	3.82	.232	6.1	5.46	2.170	39.7	3.73	.387	10.4
August	8.92	1.688	18.9	4.50	.981	21.8	3.86	.419	10.8
September	3.82	2.260	59.3	3.84	1.026	26.7	3.38	.426	12.6
October	5.10	2.313	45.3	3.52	.938	26.7	3.61	.699	19.4
November	8.21	6.950	84.6	2.16	1.018	47.0	3.86	1.345	34.8
December	5.61	4.931	87.8	2.68	1.500	56.0	3.80	1.773	46.7
Totals and averages	50.73	29.639	58.4	44.70	23.275	52.1	44.59	20.588	45.2

The following table gives the record of the yield of the Sudbury River watershed in gallons per day per square mile for each of the past six years and the mean for the past fifty-four years:

Yield of the Sudbury River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1923.	1924.	1925.	1926.	1927.	1928.	Mean for Fifty-four Years, 1875-1928.
January	1,558,000	1,796,000	184,000	863,000	1,297,000	1,305,000	1,124,000
February	935,000	715,000	1,852,000	991,000	1,462,000	1,645,000	1,553,000
March	3,172,000	1,941,000	2,183,000	2,726,000	2,054,000	1,275,000	2,674,000
April	2,435,000	3,056,000	1,491,000	1,927,000	692,000	1,760,000	1,963,000
May	1,177,000	1,399,000	581,000	720,000	768,000	1,414,000	1,100,000
June	387,000	281,000	217,000	104,000	215,000	1,585,000	517,000
July	67,000	-52,000	239,000	-68,000	130,000	1,217,000	217,000
August	-73,000	116,000	57,000	233,000	946,000	550,000	235,000
September	-57,000	408,000	39,000	-113,000	1,307,000	594,000	247,000
October	397,000	6,000	351,000	114,000	1,297,000	526,000	392,000
November	1,140,000	166,000	580,000	803,000	4,026,000	589,000	779,000
December	2,198,000	274,000	1,867,000	670,000	2,764,000	841,000	994,000
Average for whole year	114,000	841,000	797,000	746,000	1,411,000	1,105,000	980,000
Average for driest six months	307,000	152,000	247,000	167,000	676,000	721,000	396,000

¹ The drainage area of the Sudbury River used in making up these records included water surfaces amounting to about 2 per cent of the whole area from 1875 to 1878, inclusive, subsequently increasing by the construction of storage reservoirs to about 3 per cent in 1879, to 3.5 per cent in 1885, to 4 per cent in 1894, and to 6.5 per cent in 1898. The drainage area also contains extensive areas of swampy land, which, though covered with water at times, are not included in the above percentages of water surfaces.

Nashua River.

The average yield of the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton during the year 1928 was 1,176,000 gallons per day per square mile of drainage area, or about $7\frac{1}{2}$ per cent in excess of the average for the past 32 years.

The average yield for the six driest months, (July to December), inclusive, was 624,000 gallons per day per square mile, or 10.1 per cent above the normal.

The following table shows the normal yield of the river by months for the past 32 years, the actual yield in the year 1928, and the excess or deficiency in each month. The drainage area of the Nashua River above the point of measurement was 119 square miles from 1897 to 1907 and 118.19 square miles from 1908 to 1913, inclusive. Since January 1, 1914, the city of Worcester has been diverting water from 9.35 square miles of this drainage area for the supply of that city, leaving the net drainage area 108.84 square miles.

Table showing the Average Daily Yield of the South Branch of the Nashua River for Each Month in the Year 1928, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1928.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.814	1.172	2.305	1.490	+ .491	+ .318
February	2.023	1.308	2.795	1.806	+ .772	+ .498
March	3.979	2.572	1.987	1.284	-1.992	-1.288
April	3.395	2.194	3.302	2.134	- .093	- .060
May	2.013	1.301	2.555	1.651	+ .542	+ .350
June	1.284	.830	3.204	2.071	+1.920	+1.241
July . . . . .	.752	.486	1.411	.912	+ .659	+ .426
August . . . . .	.672	.435	1.023	.661	+ .351	+ .226
September . . . . .	.595	.385	1.000	.646	+ .405	+ .261
October . . . . .	.722	.466	.616	.398	- .106	- .068
November	1.256	.812	.696	.450	- .560	- .362
December	1.818	1.175	1.040	.672	- .778	- .503
Average for whole year	1.692	1.094	1.830	1.176	+ .138	+ .082

The rainfall on the Nashua River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1923 to 1928, inclusive, together with the average for the past 32 years, are given in the following table:

Rainfall, in Inches, received and collected on the Nashua River Drainage Area.

MONTH.	1923.			1924.			1925.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	7.95	3.146	39.6	4.23	3.346	79.2	3.68	.563	15.3
February	2.30	1.617	70.5	3.31	1.332	40.3	2.27	2.524	111.3
March	3.29	5.478	166.3	2.41	3.028	125.6	5.81	4.005	69.0
April	5.52	5.244	95.0	6.58	7.262	110.4	3.06	2.482	81.1
May	1.44	2.339	162.1	3.55	3.519	99.0	2.14	1.262	58.8
June	3.51	1.062	30.3	1.13	.775	68.4	3.97	.684	17.2
July	3.72	.529	14.2	2.60	.234	9.0	3.95	.417	10.6
August	2.04	.264	12.9	4.61	.449	9.7	2.04	.347	17.0
September	1.04	.159	15.3	4.79	.552	11.5	4.26	.596	14.0
October	5.16	.766	14.9	0.09	.114	122.5	4.37	.779	17.8
November	5.87	1.682	28.7	3.30	.476	14.4	3.43	1.378	40.2
December	5.07	3.062	60.4	2.03	.702	34.6	4.39	2.897	65.9
Totals and averages	46.91	25.348	54.0	38.63	21.789	56.4	43.37	17.934	41.3

Rainfall, in Inches, received and collected on the Nashua River Drainage Area
— Concluded.

MONTH.	1926.			1927.			1928.			MEAN FOR THIRTY-TWO YEARS, 1897-1928.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	2.64	1.695	64.1	3.34	2.184	65.5	3.03	2.657	87.7	3.63	2.091	57.6
February	5.77	1.340	23.2	4.63	1.784	38.6	3.92	3.014	77.0	3.86	2.123	55.1
March	2.92	3.366	115.1	1.71	4.167	244.4	2.08	2.291	110.3	3.92	4.588	117.0
April	2.46	4.165	169.4	2.10	1.669	79.7	5.30	3.679	69.4	3.87	3.788	97.8
May	2.00	1.471	73.6	3.04	1.623	53.3	2.92	2.946	100.8	3.28	2.321	70.7
June	2.05	.699	34.2	2.17	.742	34.2	6.64	3.575	53.8	3.85	1.433	37.2
July	2.93	.461	15.7	5.94	.997	16.8	4.75	1.627	34.2	4.17	.867	20.8
August	2.90	.449	15.5	9.48	2.875	30.3	5.07	1.179	23.2	4.12	.775	18.8
September	1.43	.347	24.2	3.51	2.086	59.4	3.83	1.117	29.1	3.63	.664	18.3
October	4.69	.691	14.7	5.02	1.972	39.2	1.99	.710	35.7	3.22	.832	25.8
November	5.32	1.512	28.4	7.50	4.521	60.3	2.40	.776	32.4	3.75	1.401	37.3
December	4.20	1.162	27.7	6.23	4.552	73.0	2.08	1.199	57.6	4.01	2.096	52.3
Totals and averages	39.31	17.358	44.2	54.67	29.172	53.4	44.01	24.770	56.3	45.31	22.979	50.7

The following table gives the record of the yield of the Nashua River watershed in gallons per day per square mile for each of the past six years and the mean for the past 32 years:

*Yield of the Nashua River Drainage Area in Gallons per Day per Square Mile.*¹

MONTH.	1923.	1924.	1925.	1926.	1927.	1928.	Mean for Thirty-two Years, 1897-1928.
January	1,764,000	1,876,000	316,000	951,000	1,224,000	1,490,000	1,172,000
February	1,004,000	798,000	1,566,000	831,000	1,108,000	1,806,000	1,308,000
March	3,071,000	1,697,000	2,245,000	1,887,000	2,336,000	1,284,000	2,572,000
April	3,042,000	4,213,000	1,440,000	2,416,000	968,000	2,134,000	2,194,000
May	1,311,000	1,973,000	708,000	825,000	910,000	1,651,000	1,301,000
June	615,000	449,000	396,000	405,000	430,000	2,071,000	830,000
July	297,000	131,000	234,000	258,000	559,000	912,000	486,000
August	148,000	252,000	194,000	252,000	1,612,000	661,000	435,000
September	92,000	320,000	345,000	201,000	1,207,000	646,000	385,000
October	430,000	64,000	437,000	387,000	1,105,000	398,000	466,000
November	974,000	276,000	799,000	876,000	2,619,000	450,000	812,000
December	1,717,000	394,000	1,624,000	651,000	2,552,000	672,000	1,175,000
Average for whole year	1,207,000	1,035,000	854,000	826,000	1,389,000	1,176,000	1,094,000
Average for driest six months	424,000	239,000	386,000	389,000	949,000	624,000	567,000

¹ The drainage area used in making up these records included water surfaces amounting to 2.2 per cent of the whole area from 1897 to 1902, inclusive, to 2.4 per cent in 1903, to 3.6 per cent in 1904, to 4.1 per cent in 1905, to 5.1 per cent in 1906, to 6 per cent in 1907, to 7 per cent in 1908, 1909 and 1910, to 6.5 per cent in 1911, to 6.8 per cent in 1912, to 7 per cent in 1913, to 7.4 per cent in 1914 and 1915, to 7.6 per cent in 1916, to 7.4 per cent in 1917 and 1918, to 7.5 per cent in 1919, 1920, 1921 and 1922, to 7.4 per cent in 1923 and 1924, to 6.4 per cent in 1925, to 5.9 per cent in 1926, to 5.7 per cent in 1927 and 7.6 per cent in 1928.

Merrimack River.

The Merrimack River is the second in size of the streams of Massachusetts. The river rises in the White Mountains of New Hampshire and flows southerly through the central part of that State until it enters Massachusetts, where it turns to the east and flows in a general northeasterly direction the remainder of its course to the sea. The total length of its watershed from its extreme northerly limits in the mountains of northern New Hampshire to its extreme southerly limits in the hills of Hopkinton, Massachusetts, is about 137 miles and its extreme width about 66 miles. Its total drainage area above its mouth at Newburyport is about 5,000 square miles, of which about one-quarter is within the limits of Massachusetts and the remainder within the State of New Hampshire.

Records of the flow of the Merrimack River have been kept continuously at Lawrence since 1880. The drainage area of the river at that point is 4,663 square miles, including 118.19 square miles tributary to the South Branch of the Nashua

River used for the water supply of the Metropolitan District and in part for the city of Worcester, 75.2 square miles on the Sudbury River, and 18 square miles tributary to Lake Cochituate. The flow as measured at Lawrence includes the water wasted from these drainage areas. In presenting the record of the flow of the river these drainage areas have been deducted, leaving the net drainage area above Lawrence 4,567 square miles in 1880, 4,570 square miles in the years 1891 to 1897, inclusive, and 4,452 square miles since the latter year. The quantity of water overflowing from the Cochituate and Sudbury watersheds as measured by the Metropolitan District Commission has also been deducted from the flow of the river as measured at Lawrence. The average flow of the river during the year 1928 amounted to 1.901 cubic feet per second per square mile, or 1,228,600 gallons per day per square mile of drainage area, which is about 28.8 per cent above the normal for the past 49 years. The flow exceeded the normal in January and February, and in the months of May to October, inclusive; the greatest deficiency occurred in March.

The following table shows the relation between the normal flow of this stream during the past 49 years and the actual flow during each month of the year 1928.

Table showing the Average Monthly Flow of the Merrimack River at Lawrence for the Year 1928, in Cubic Feet per Second per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	Normal Flow, 1880-1928.	Actual Flow in 1928.	Excess or Deficiency.
January	1.263	2.039	+ .776
February	1.351	2.069	+ .718
March	2.739	2.048	- .691
April	3.503	3.437	- .066
May	2.243	3.160	+ .917
June	1.261	2.300	+1.039
July . . . . .	.774	1.636	+ .862
August . . . . .	.662	1.550	+ .888
September . . . . .	.657	1.500	+ .843
October . . . . .	.800	.977	+ .177
November	1.150	.979	- .171
December	1.303	1.115	- .188
Average for whole year	1.476	1.901	+ .425

The following table gives the record of the flow of the Merrimack River at Lawrence for each of the past six years, together with the average flow for the past 49 years, this amount being expressed in cubic feet per second per square mile of drainage area:

Flow of the Merrimack River at Lawrence in Cubic Feet per Second per Square Mile.

MONTH.	1923.	1924.	1925.	1926.	1927.	1928.	Mean for Forty-nine Years, 1880-1928.
January	1.074	1.964	.357	1.027	.955	2.039	1.263
February . . . . .	.855	.978	1.882	.796	1.047	2.069	1.351
March	1.956	1.767	3.413	1.648	3.161	2.048	2.739
April	4.958	5.050	3.102	3.933	1.828	3.437	3.503
May	2.904	3.115	1.849	2.165	1.417	3.160	2.243
June . . . . .	.730	.920	.689	.843	.785	2.300	1.261
July . . . . .	.434	.464	.712	.527	.645	1.636	.774
August . . . . .	.394	.350	.518	.405	.708	1.550	.662
September . . . . .	.303	.753	.454	.341	.949	1.500	.657
October . . . . .	.491	.612	.735	.509	1.355	.977	.800
November	1.177	.536	1.067	1.395	3.733	.979	1.150
December	2.372	.712	1.577	.872	3.015	1.115	1.303
Average for whole year	1.471	1.435	1.321	1.205	1.633	1.901	1.476
Average for driest six months . . . . .	.588	.571	.696	.670	.977	1.293	.884

Sudbury, Nashua and Merrimack Rivers.

The following table shows the weekly fluctuations during the year 1928 in the yield of the Sudbury River at Framingham, the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton, and the Merrimack River at

Lawrence. The flow of these streams, particularly that of the Sudbury River and the South Branch of the Nashua River, serves to indicate the flow of other streams in eastern Massachusetts. The area of the Sudbury River watershed is 75.2 square miles, of the South Branch of the Nashua River 118.19 square miles, and of the Merrimack River at Lawrence 4,452 square miles.

Table showing the Average Weekly Flow of the Sudbury, South Branch of the Nashua and the Merrimack Rivers for the Year 1928, in Cubic Feet per Second per Square Mile of Drainage Area.

WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.	WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.
Jan. 1	3.706	3.101	2.105	July 1	2.078	2.391	1.853
8	2.859	1.845	2.153	8	2.859	1.577	2.140
15	1.915	2.083	2.015	15	2.914	1.663	1.244
22	1.655	1.790	1.646	22	2.860	1.445	1.337
29	2.199	3.428	2.274	29	1.787	1.167	1.623
Feb. 5	2.377	1.557	1.771	Aug. 5	1.657	0.567	1.641
12	2.486	2.601	1.735	12	1.124	0.739	1.847
19	3.262	4.273	2.493	19 . . . . .	.600	0.471	1.311
26	4.409	2.866	2.239	26	1.268	1.328	1.047
Mar. 4	3.454	1.528	1.905	Sept. 2	1.520	1.681	2.115
11	2.412	1.295	1.367	9	1.182	1.500	1.757
18	2.180	2.192	1.934	16	1.426	0.459	1.385
25	2.588	2.301	2.018	23	1.353	1.605	1.532
Apr. 1	2.539	2.441	3.130	30	1.588	0.513	1.268
8	2.377	1.842	3.135	Oct. 7	1.454	0.591	1.009
15	1.556	1.785	4.172	14 . . . . .	.548	0.512	.840
22	1.667	2.154	2.587	21 . . . . .	.610	0.640	.844
29	5.908	7.086	3.729	28	1.834	0.795	1.148
May 6	3.668	3.995	4.648	Nov. 4	1.536	0.579	1.017
13	2.132	1.619	2.965	11	1.518	0.662	.981
20	2.408	2.094	1.968	18	2.261	0.523	.849
27	2.618	3.269	3.246	25	1.368	0.845	1.175
June 3	1.758	2.041	3.102	Dec. 2	2.031	0.854	.901
10	2.846	4.540	2.650	9	1.705	1.025	1.146
17	2.123	2.983	2.618	16	1.706	0.695	.910
24	3.931	3.530	1.841	23	1.641	1.155	1.259
				30	1.633	1.300	1.175

EXAMINATION OF RIVERS.

Samples of water were collected for analysis from the more important rivers of the State during the months of June to November, inclusive, at approximately the same points as those from which samples have been taken in past years.

Aberjona River.

No material progress has been made during the past year in completing the sewer constructed in 1927 for the removal of sewage and wastes now being discharged into the Aberjona River in violation of the provisions of Chapter 291 of the Acts of 1911, and considerable quantities of sewage and objectionable wastes are still being discharged into this stream contrary to the provisions of that act.

In the earlier part of the year considerable quantities of sewage were allowed to overflow from the public sewers into the stream at Winchester due to the inadequate capacity of the Metropolitan sewers below Winchester. An additional Metropolitan sewer is now being constructed, but pending its completion it will probably continue to be necessary from time to time to discharge limited quantities of sewage into the stream. A special act relative to this matter was passed by the Legislature of 1928, Chapter 124 of the Acts of 1928, under which the Department in an emergency can authorize the discharge of sewage from the Metropolitan and Winchester sewers into the Aberjona River until the end of 1930. The act was approved on March 16, 1928, but no application for the approval of the discharge of sewage into the stream had been made up to the end of the year. The results of the analyses of samples of the water of the river at the entrance to the Mystic Lakes showed that the water contained more organic matter as rep-

resented by the albuminoid ammonia than in any year since 1920, and the samples from the upper Mystic Lake also contained more organic matter than for several years. The river was in an offensive condition throughout most of its course, especially below Salem Street.

Under date of September 18, 1928, a letter was sent to the Mayor of Woburn asking for information relative to the action which that city proposes to take in the reconstruction of the sewer designed to prevent the pollution of this stream, but at the end of the year no reply had been received.

Assabet River.

Above and below Westborough there has been evidence of a slight improvement in the condition of the river during the past year. Analyses of the water from various points in the upper section of its course down to a point below Northborough show a slight improvement compared with its condition in recent years, but nevertheless complaint has been made relative to the pollution of the river by the sewage from a part of the Grafton State Hospital and by the overflow of sewage from the sewage filter beds of the town of Westborough, and it has been found necessary to urge the removal of the sewage from a portion of the Grafton State Hospital to the main sewerage system of that institution and also to recommend an improvement of the filters of the town of Westborough. The condition of the river below Hudson has shown marked improvement as compared with the previous year, while below Maynard the analyses indicate that the river has been in better condition than in any year since 1922. This improvement has doubtless been due largely to the abnormally large quantity of water flowing in the river, especially during the summer season, and possibly in part to a diminution in the discharge of industrial wastes. Plans were approved during the year for the construction of a sewerage system and sewage disposal works for the town of Maynard, and considerable progress has already been made in the construction of these works. In connection with the proposed improvement in the methods of disposing of the sewage of the Massachusetts Reformatory at Concord, the Department has recommended that the heavy industrial wastes discharged into the river from this institution be removed from the stream and properly disposed of.

Blackstone River.

The samples of water from the Blackstone River below Worcester both above and below the sewage disposal works of the city show an improvement in the condition of the river, and the improvement is even more marked at Millbury, Northbridge, Uxbridge and Millville. This is probably due in part to a larger flow, but it is due in part also to a considerable improvement in the effectiveness of the purification of the sewage of the city of Worcester. While there has been an improvement in the condition of the river, so far as the chemical analyses are concerned, an examination of the river below Worcester and Millbury shows the presence of great quantities of tar and oil indicating the discharge of large quantities of industrial wastes apparently from some of the industries in Worcester.

Charles River.

The objectionable conditions noted last year in the upper portion of the course of this stream were not in evidence this year, but there is still evidence of considerable pollution. Mine Brook below the Franklin sewage filters has shown an increase in pollution over the previous years. Lower down in its course the improvement noted in the river below Milford has not been as marked, though the river does not appear to have been in an objectionable condition due to sewage pollution during the past year. Special samples have been collected of the Charles River Basin in connection with special studies relative to the improvement of this basin and the use of the water for public bathing, and the results are referred to in House Document No. 1050 of the Legislature of 1929.

Chicopee River.

Examinations of the Chicopee River and its tributaries have shown no changes of any consequence during the year. The stream receives much pollution, especially in the lower portion of its course, but its sanitary condition has not been seriously objectionable at any point during the year.

Concord and Sudbury Rivers.

Samples of the water of Bannister Brook, which receives the effluent of the sewage filter beds of the towns of Natick and Framingham, have shown a marked increase in pollution over the last few years, and this small stream has been in an objectionable condition due to the overflow of sewage and of poorly purified effluent from the works of these towns. The Sudbury River below Saxonville has also shown an increase in pollution over any recent year. The increase in pollution has not been noticeable at the mouth of the stream in Concord. The Concord River has shown no change during the year throughout most of its course, the analyses being nearly the same as those of the previous year, but near its mouth in Lowell the pollution of the river has been more marked than in any recent year.

Connecticut River.

The condition of this stream as shown by analyses of its waters during the past year has shown no material change as compared with previous years.

French River.

There has been somewhat less evidence of pollution of the French River below Webster and Dudley than in previous years due apparently to the greater flow of water in the river during the past year. No further action appears to have been taken by the towns of Webster and Dudley relative to the construction of sewage disposal works.

Hoosick River.

The limited amount of information available relative to the condition of the Hoosick River indicates a marked increase in its pollution below North Adams.

Merrimack River.

In response to a resolve of the Legislature a special examination was made of the Merrimack River during 1928, the results of which were reported to the Legislature of 1929 in House Document No. 82. The results in general indicated an improvement in the condition of the river as compared with previous examinations due in part to a material increase in the flow of the stream during the year and a decrease in the industrial activities of the cities in this valley, and in consequence a decrease in the quantity of sewage and industrial waste discharged into the river.

Millers River and its Tributaries.

The condition of this river shows considerable improvement as compared with previous years due mainly to the unusually large flow of water in the drier part of the year. The river in its upper waters is still polluted to a considerable extent by imperfectly purified sewage from the Gardner sewage disposal works, but a material improvement is noted below Winchendon doubtless due to the treatment of some of the sewage from that town at the new sewage disposal works now in operation.

Farther down stream below Athol and Orange the river has shown less evidence of pollution than in recent years.

Nashua River.

The North Branch of the Nashua River below Fitchburg has shown somewhat less evidence of pollution than formerly, due largely to a reduction in the amount of manufacturing waste discharged into the river, but below Leominster the condition of the stream is very objectionable. Practically all of the sewage of Leominster is still discharged directly into the river and its condition from that city down to the junction of the South Branch at Lancaster has been a source of complaint during the year. The city of Leominster has recently appointed a commission to investigate the matter of providing proper sewage disposal works for that city.

Neponset River.

This river continues to be very badly polluted throughout much of its course and, though much of the manufacturing waste and part of the sewage are treated at disposal works, the condition of the river is objectionable and has been growing

worse in recent years. The condition of this stream and the circumstances affecting its pollution were the subject of a general investigation in 1926, the results of which were presented to the Legislature in House Document 212 of 1927. This report was referred to the Legislature of 1928 and an act was passed, Chapter 384 of the Acts of 1928, admitting the towns of Canton, Norwood, Stoughton and Walpole to the South Metropolitan Sewerage District and directing the construction of a sewer to remove the sewage and other wastes from these municipalities into the South Metropolitan system.

Taunton River.

The Taunton River and its tributaries receive much pollution from the sewage and manufacturing waste in certain of the large towns within the valleys of these streams. Owing to the greater flow of water in the rivers in 1928, the evidences of pollution of the river have not been quite as marked as in previous years in most parts of the watershed, though the main stream above Taunton shows evidence of the presence of a greater amount of organic matter than in any year since 1919.

The river below Taunton and at Berkeley Bridge also shows a general increase in pollution in recent years.

Ten Mile River.

Complaint has been made during the year relative to objectionable conditions in the Ten Mile River above Attleboro, and an investigation indicates that the pollution is due to the discharge of imperfectly purified sewage from the North Attleborough sewage filters which are inadequate for the proper treatment of all of the sewage discharged from the town. There is no indication that the river receives pollution of much consequence in its course through Attleboro.

EXAMINATION OF SEWAGE DISPOSAL WORKS.

At Attleboro the sewage has been well distributed over the entire disposal area, and the results of the operation have been more satisfactory than in 1927.

At Brockton a new pipe line has been laid between the trickling filter plant and the sand filters, and a larger proportion of the sewage has been treated by the trickling filter and subsequently passed through the sand filters than in previous years.

At Clinton the quantity of sewage pumped to the disposal works was slightly less than during the year 1927. The filter beds are not capable of treating satisfactorily all of the sewage, and large quantities have overflowed after sedimentation into the south branch of the Nashua River.

At Concord the area of the filter beds has been increased by 1.2 acres in preparation for the increase in quantity of sewage due to the construction of sewers to serve the district of West Concord. At the end of the year, however, no connections had been made with the system in the West Concord district. The results of the operation of the filter beds has been satisfactory.

At Easthampton all of the sewage was passed through the settling tanks as in previous years. Less than one-half of it, however, is filtered through the sand filter beds, and the larger part is discharged directly into the Manhan River without further treatment.

The sewage disposal works at Fitchburg have been operated throughout the year with the usual care, and with the use of the new grit chamber constructed two years ago more satisfactory results have been obtained. A sewerage system has been constructed in the Whalom district of Leominster during the year, and a connection has been made through which the sewage is delivered to the Fitchburg plant. As yet very little sewage has been discharged from the Whalom district into the Fitchburg disposal works through this new connection.

At Framingham the plant as a whole has shown slightly better efficiency than in 1927. Examinations have shown the presence of inferior filtering material in some of the filters, and there is evidence of clogging as a result of which considerable quantities of sewage have been allowed to overflow from time to time into Bannister Brook without proper purification.

At Franklin the strength of the sewage was less than in 1927 and, although the sewage is not properly distributed over the filtration area, the quality of the ef-

fluent discharged from the underdrains was somewhat better than the previous year. More care is necessary at this plant, particularly in the matter of distributing the sewage more evenly over the whole area.

The condition of the sewage disposal works at Gardner has remained about the same as in recent years. The strength of the sewage at both the Gardner and Templeton areas was slightly less than in 1927, but the purification is not satisfactory, and the discharge of more or less improperly purified sewage into the Otter River has continued as in previous years.

The sewage filters at Leicester have been largely rebuilt during the year and the filtration area increased about 0.2 of an acre.

Judging from the results of examinations of the operation of the sewage disposal works at Milford there has been a marked improvement in the efficiency of the Imhoff tank and trickling filter plant. The disposal works have received more attention than in recent years, and the character of the effluent of the sand filters also shows a slight improvement over that of the last year.

At Natick the efficiency of the filtration area is still unsatisfactory and the works are inadequate for the proper treatment of all of the sewage of the town. An improvement could be effected by a more thorough distribution of the sewage, but an additional area of filters is greatly needed.

At North Attleborough the operation of the filter beds has continued to be unsatisfactory as was the case in 1927. The area of the filters is inadequate for the disposal of all the sewage, and large quantities overflow into a swamp below the sewage disposal area.

At Northbridge since the reconstruction of many of the filter beds in 1927 and the removal of poor material the filters have shown more satisfactory results.

At Norwood the filter beds have been used regularly and sewage distributed as well as possible, but the area of the filters is not sufficient for the proper treatment of all the sewage of the town. Surveys have been begun for the extension of the Metropolitan sewer which when completed will make these disposal works unnecessary.

The disposal works at Pittsfield are still inadequate for the effective treatment of the quantity of sewage now discharged from the city, and much sewage is discharged into the Housatonic River without treatment. The records show a marked increase in the quantity of sewage discharged untreated from this works.

At Southbridge the area of the filter beds is still inadequate for the proper treatment of all the sewage of the town, and large quantities are discharged untreated into the Quinebaug River.

Complaint has been made during the year relative to the discharge of crude sewage into the Assabet River from the Westborough sewage disposal works, and in connection with this complaint the Department, in a communication dated June 25, 1928, recommended that the town proceed with the extension of the filter beds at the earliest practicable time. Subsequently the question was raised as to the effect on the Westborough filter beds if the work of draining and reclaiming lands adjacent to the Assabet River were continued to a point in the vicinity of the Westborough sewage filters. After an examination the Department, in another communication dated September 18, 1928, recommended that records be obtained as to the fluctuations in the level of the Assabet River near the filters with a view to determining whether or not the flooding of the underdrains would be relieved.

At Worcester the new sewage disposal works, consisting of Imhoff tanks, trickling filters and secondary tanks, have been in use throughout the year and have shown a marked improvement in the purification of the sewage over the earlier years of operation.

The results of the operation of the other larger municipal sewage disposal works have been about as in previous years.

The results of the analyses of sewage and effluent, together with statistics concerning the more important sewage disposal works, are presented in the following tables:

TABLE No. 1. — Average Results of the Analyses of Monthly Samples of Sewage as received at Disposal Works. (Fats determined in about 63 Per Cent of the Samples.)
[Paris in 100,000.]

CITY OR TOWN.	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.	OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.				Unfil-tered.	Fil-tered.	Unfil-tered.	Fil-tered.		
	Total.	Dis-solved.	Sus-pended.	Total.	Dis-solved.	Sus-pended.											
ATTLEBORO ¹	38.37	28.10	10.27	18.97	11.63	7.34	3.14	.56	.30	.26	3.53	4.67	3.08	.168	.087	1.13	10.68
BROCKTON ²	49.99	34.07	15.92	26.26	13.27	12.99	4.41	.75	.37	.38	6.00	6.69	3.50	.128	.050	1.61	5.25
Clinton ²	143.65	78.62	65.03	84.91	37.73	47.18	3.47	1.56	.82	.74	5.11	16.03	8.56	.191	.065	3.59	32.92
Concord ¹	27.77	22.70	5.07	14.50	10.43	4.07	2.06	.38	.23	.15	2.32	3.90	2.61	.096	.042	.92	—
Easthampton ¹	46.23	32.37	13.86	25.27	13.70	11.57	2.92	.60	.33	.27	4.30	5.83	2.93	.079	.036	1.28	—
FITCHBURG	35.10	24.78	10.32	17.05	9.67	7.38	1.73	.46	.24	.22	3.07	4.26	2.74	.190	.088	.95	6.76
Frammingham (Imhoff) ³	74.08	46.05	28.03	42.23	20.28	21.95	4.01	.94	.59	.35	6.40	8.70	5.13	.209	.078	1.80	9.18
Frammingham ²	94.33	49.43	44.90	55.22	22.73	32.49	4.14	1.42	.84	.58	6.20	11.67	6.09	.356	.111	2.88	10.72
Franklin ¹	27.68	24.50	3.18	10.98	8.67	2.31	2.23	.35	.21	.14	4.15	2.07	1.60	.079	.039	.69	—
GARDNER (Gardner Area) ⁴	91.40	49.50	41.90	58.35	24.95	33.40	6.20	1.49	.87	.62	6.27	12.15	7.15	.152	.055	3.00	12.80
GARDNER (Templeton Area)	51.76	36.56	15.20	27.48	15.13	12.35	5.74	.94	.60	.34	5.07	6.69	3.82	.124	.050	2.04	6.13
Hopedale ²	59.03	42.83	16.20	28.83	16.03	12.80	4.98	.79	.52	.27	5.41	7.07	3.67	.181	.062	1.84	—
Hudson ²	67.67	41.42	26.25	40.55	19.47	21.08	7.13	1.25	.78	.47	5.56	9.11	4.89	.118	.042	2.39	10.05
Leicester ⁴	42.16	31.00	11.16	21.32	12.76	8.56	2.94	.61	.37	.24	3.43	4.52	2.56	.088	.031	1.32	—
Marion ¹	39.07	31.30	7.77	17.40	11.43	5.97	2.28	.56	.32	.24	8.23	3.38	2.20	.106	.046	1.09	—
MARLBOROUGH	57.55	37.83	19.72	31.93	16.15	15.78	3.24	.81	.47	.34	5.06	7.40	3.61	.149	.077	1.51	8.31
Milford	42.78	29.69	13.09	21.76	11.62	10.14	4.16	.67	.37	.30	4.55	5.25	3.06	.087	.037	1.37	—
Natick ²	52.53	39.93	12.60	23.55	14.62	8.93	3.48	.64	.37	.27	7.17	4.84	3.06	.132	.054	1.31	5.28
North Attleborough ¹	29.67	24.33	5.34	13.63	9.10	4.53	2.10	.39	.22	.17	2.85	2.67	1.73	.105	.050	.87	—
Northbridge	36.59	23.65	12.94	22.27	11.69	10.58	4.32	.79	.46	.33	2.78	5.00	2.66	.093	.039	1.60	—
Norwood	88.17	50.27	37.90	49.25	21.05	28.20	3.16	.76	.38	.38	8.85	10.15	6.29	.232	.066	1.70	9.02
PITTSFIELD ²	40.95	34.90	6.05	19.28	14.73	4.55	2.20	.44	.28	.16	4.02	5.20	3.48	.079	.032	.93	3.57
Southbridge ¹	61.97	41.04	20.93	37.17	20.07	17.10	3.88	.95	.53	.42	4.83	8.03	4.82	.123	.053	1.90	11.56
Spencer ¹	159.50	42.50	117.00	121.03	25.07	95.96	4.89	2.41	1.56	.85	3.87	19.55	7.78	.395	.093	4.48	21.63
Stockbridge ⁴	28.35	25.90	2.45	13.50	11.75	1.75	2.51	.36	.28	.08	1.52	2.37	1.66	.035	.023	.71	—
Westborough	60.08	44.27	15.81	32.20	19.15	13.05	3.26	.73	.41	.32	5.87	9.60	6.55	.159	.084	1.46	9.66
Worcester	87.49	53.96	33.53	30.58	12.23	18.35	2.15	.63	.18	.45	8.42	8.36	3.10	6.560	1.750	1.49	—

¹ Six samples.² At pumping station.³ Entrance to Imhoff tanks, including Saxonville sewage.⁴ Four samples.

TABLE No. 2. — Average Results of the Analyses of Monthly Samples of Sewage as Applied to Filter Beds after Preliminary Treatment as Indicated. (Fats determined in about 63 Per Cent of the Samples.)

[Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	RESIDUE ON EVAPORATION.				AMMONIA.			OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.	
		TOTAL RESIDUE.		LOSS ON IGNITION.		Free.	ALBUMINOID.		Unfiltered.	Filtered.	Unfiltered.	Filtered.			
		Total.	Dissolved.	Suspended.	Total.		Dissolved.	Suspended.							
ATTLEBORO ¹	None	38.37	28.10	10.27	18.97	11.63	7.34	3.14	.56	.30	.26	3.53	3.08	1.13	10.68
BROCKTON	Tanks	37.47	30.75	6.72	15.53	10.53	5.00	2.17	.33	.18	.15	5.96	3.48	.76	2.00
Clinton	Basins	52.06	43.56	8.50	24.98	19.16	5.82	2.37	.56	.39	.17	4.24	4.67	1.12	7.53
Concord ¹	None	27.77	22.70	5.07	14.50	10.43	4.07	2.06	.38	.23	.15	2.32	3.90	.92	-
Easthampton	Tanks	42.40	33.53	8.87	21.63	14.47	7.16	2.86	.51	.27	.24	4.40	6.00	1.21	-
FITCHBURG	Imhoff	25.81	22.91	2.90	10.76	8.96	1.80	1.74	.26	.19	.07	3.10	2.98	.69	2.16
Frammingham	Imhoff	46.48	38.82	7.66	20.85	15.79	5.06	4.22	.63	.42	.21	5.68	5.34	1.18	3.74
Franklin	Tanks	22.03	20.62	1.41	8.18	7.15	1.03	1.95	.23	.17	.06	3.38	1.84	.47	-
GARDNER (Gardner Area)	None	91.40	49.50	41.90	58.35	24.95	33.40	6.20	1.49	.87	.62	6.27	12.15	3.00	12.80
GARDNER (Templeton Area)	Tanks	26.98	23.78	3.20	10.88	8.70	2.18	2.57	.35	.21	.14	3.51	2.56	.74	2.29
Hopedale ¹	Tanks	33.87	27.50	6.37	17.70	12.70	5.00	3.85	.43	.26	.17	3.38	3.15	.88	-
Hudson	Tanks	38.10	31.05	7.05	18.53	13.15	5.38	3.85	.53	.33	.20	4.44	3.96	1.10	4.09
Leicester ²	None	42.16	31.00	11.16	21.32	12.76	8.56	2.94	.61	.37	.24	3.43	4.52	.88	-
Marion ¹	None	36.07	31.30	7.77	17.40	11.43	5.97	2.28	.56	.32	.24	8.23	3.38	1.09	-
MALBOROUGH	Tanks	48.43	38.25	10.18	23.83	16.58	7.25	3.53	.64	.42	.22	5.59	5.58	1.22	6.27
Milford	Tanks	36.09	30.22	5.87	16.16	11.84	4.32	3.45	.38	.24	.14	4.41	3.31	.92	-
Milford	Imhoff	28.65	25.25	3.40	11.35	8.77	2.58	2.49	.27	.18	.09	3.89	2.29	.59	-
Natick	None	52.53	39.93	12.60	23.55	14.62	8.93	3.48	.64	.37	.27	7.17	4.84	1.31	5.28
North Attleborough ¹	Tanks	25.87	23.43	2.44	10.57	8.80	1.77	2.23	.28	.20	.08	2.86	2.68	.65	-
Northbridge	Tanks	19.13	16.38	2.75	9.71	7.78	1.93	1.86	.29	.16	.13	2.01	2.46	.61	-
Norwood	Tank	93.33	55.29	38.04	47.33	19.12	28.21	2.99	.85	.35	.50	13.13	11.39	2.03	13.68
Pittsfield	None	40.95	34.90	6.05	19.28	14.73	4.55	2.20	.44	.28	.16	4.02	5.20	.93	3.57
Southbridge ¹	Tanks	47.93	37.67	10.26	24.77	17.10	7.67	4.34	.73	.38	.35	5.51	5.60	1.31	5.77
Spencer ¹	None	159.50	42.50	117.00	121.03	25.07	95.96	4.89	2.41	1.56	.85	3.87	19.55	4.48	21.63
Stockbridge ²	None	28.35	25.90	2.45	13.50	11.75	1.75	2.51	.36	.28	.08	1.52	2.37	.71	-
Westborough	None	60.08	44.27	15.81	32.20	19.15	13.05	3.26	.73	.41	.32	5.87	9.60	1.46	9.66
Worcester	Imhoff	62.47	47.33	15.14	14.67	7.92	6.75	2.58	.34	.14	.20	8.55	3.96	1.83	-

¹ Six samples.

² Four samples.

TABLE NO. 3. — *Efficiency of Settling Tanks and Other Forms of Preliminary Treatment as Indicated by the Foregoing Tables.*

[Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	SUSPENDED SOLIDS.			TOTAL ALUMINOID AMMONIA.			OXYGEN CONSUMED.			FATS. ¹		CHLORINE.	
		Raw Sewage.	Settled Sewage.	Per Cent removed.	Raw Sewage.	Settled Sewage.	Per Cent removed.	Raw Sewage.	Settled Sewage.	Per Cent removed.	Raw Sewage.	Settled Sewage.	Raw Sewage.	Settled Sewage.
BROCKTON	Tanks	15.92	6.72	58	.75	.33	56	6.69	3.48	48	5.25	2.00	6.00	5.96
Clinton	Basins	65.03	8.50	87	1.56	.56	64	16.03	4.67	71	32.92	7.53	5.11	4.24
Easthampton	Tanks	13.86	8.87	36	.60	.51	15	5.83	6.00	—	—	—	4.30	4.40
FITCHBURG	Imhoff	10.32	2.90	72	.42	.26	38	4.26	2.98	30	6.76	2.16	3.07	3.10
Framingham ²	Imhoff	28.03	7.66	73	.94	.63	33	8.70	5.54	36	10.72	3.74	6.20	5.68
Franklin	Tanks	3.18	1.41	56	.35	.23	34	2.07	1.84	11	—	—	4.15	3.38
GARDNER (Templeton Area)	Tanks	15.20	3.20	79	.94	.35	63	6.69	2.56	62	6.13	2.29	5.07	3.51
Hopedale	Tanks	16.20	6.37	71	.79	.43	46	7.07	3.15	55	—	—	5.41	3.38
Hudson	Tanks	26.25	7.05	73	1.25	.53	58	9.11	3.96	56	10.05	4.09	5.56	4.44
MALBOROUGH	Tanks	19.72	10.18	48	.81	.64	21	7.40	5.58	25	8.31	6.27	5.06	5.59
Milford	Tanks	13.00	5.87	55	.67	.38	43	5.25	3.31	37	—	—	4.55	4.41
Milford	Imhoff	13.00	3.40	74	.67	.27	60	5.25	2.29	56	—	—	4.55	3.80
North Attleborough	Tanks	5.34	2.44	54	.39	.28	28	2.67	2.68	—	—	—	2.85	2.86
Northbridge	Tanks	12.94	2.75	79	.79	.28	63	5.00	2.46	51	—	—	2.58	2.01
Norwood	Tank	37.90	38.04	—	.76	.85	—	10.15	11.39	—	9.02	13.68	8.85	13.13
Southbridge	Tanks	20.93	10.26	51	.95	.73	23	8.03	5.60	30	11.56	5.77	4.83	5.51
WORCESTER	Imhoff	33.53	15.14	55	.63	.34	48	8.36	3.96	53	—	—	8.42	8.55

¹ Fats determined in about 63 per cent of samples.² The analyses of the comparatively small quantity of sewage from Saxonville not used in determining the efficiency of these tanks.

TABLE No. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc.*
 [Parts in 100,000.]
Brockton.

	RESIDUE ON EVAPORATION.						AMMONIA.				NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.									
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.											
Settled sewage as applied to trickling filter.	37.47	30.75	6.72	15.53	10.53	5.00	2.17	.33	.18	.15	3.48	1.84	.76	2.00	Trickling filter has an area of 2.0 acres and a depth of 10 feet of stone from 1.5 to 3 inches in size.		
Effluent from trickling filter.	39.09	30.76	8.33	19.16	12.84	6.32	3.18	.50	.26	.24	4.83	2.83	1.09	3.40	One half of filter used alternately. The average rate of operation was about 1,384,000 gallons per acre per day.		
Per cent removed by Settled effluent from trickling filter.	37.84	32.42	5.42	15.46	11.71	3.75	1.90	.23	.13	.10	2.73	1.47	.54	1.29	Period of sedimentation averages about 1.41 hours.		
Per cent removed by tank.	3	—	35	19	3	41	40	54	50	58	44	48	51	62			
Per cent removed by trickling filter and settling tank.	—	—	19	.4	—	25	12	30	28	33	19	20	29	36	Tanks cleaned 48 times.		

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc. — Continued.*

[Parts in 100,000.]

Fitchburg.

	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.		NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			ALBUMINOID.												
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.	Free.	Total.	Dissolved.	Suspended.									
Imhoff tank effluent as applied to trick- ling filter.	25.81	22.91	2.90	10.76	8.96	1.80	1.74	.26	.19	.07	3.10	-	2.98	2.06	.69	2.16	Trickling filter has an area of 2.14 acres and a depth of 10 feet of stone from 1 to 3 inches in size. The average rate of op- eration was about 2,150,000 gallons per day for area used (1.86 acres).		
Effluent from trick- ling filter.	26.89	22.65	4.24	10.64	8.25	2.39	.37	.14	.06	.08	3.15	.0282	1.43	.94	.37	-	-		
Per cent removed Settled effluent from trickling filter as discharged to Nashua River.	-	1 21.76	- 4.39	1 10.36	8 8.33	- 2.03	79 .39	46 .12	68 .06	- .06	- 3.09	- .0238	52 1.41	54 .93	46 .33	- -	- -		
Per cent removed by secondary settling tanks.	3	4	-	3	-	15	-	14	0	25	2	-	1	1	11	-	Period of sedimenta- tion about 6 hours.		
Per cent removed by trickling filter and secondary tanks.	-	5	-	4	7	-	78	54	68	14	.3	-	53	55	52	-	Tanks cleaned 4 times.		

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc. — Continued.*

[Parts in 100,000.]

Milford.

	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.	NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Pats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.				Nitrates.	Nitrites.	Unfiltered.	Filtered.			
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.												
Imhoff tank effluent as applied to trickling filter.	28.65	25.25	3.40	11.35	8.77	2.58	2.49	.27	.18	.09	3.89	-	2.29	1.70	.59	-	-	Trickling filter has an area of .28 of an acre and a depth of 6 feet of stone 1 to 1 1/4 inches in size.
Effluent from trickling filter.	32.80	28.72	4.08	13.15	10.27	2.88	.53	.17	.08	.09	4.07	.0566	1.54	.89	.41	-	-	
Per cent removed	-	-	-	-	-	-	79	37	56	0	-	-	33	48	31	-	-	
Settled effluent from trickling filter as discharged to Charles River.	32.92	30.25	2.67	13.18	11.13	2.05	.55	.13	.07	.06	4.51	.0330	1.41	.95	.35	-	-	
Per cent removed by secondary settling tank.	-	-	35	-	-	28	-	24	13	33	-	-	8	-	15	-	-	
Per cent removed by trickling filter and secondary settling tank.	-	-	21	-	-	20	78	52	61	33	-	-	38	44	40	-	-	

TABLE No. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc. — Concluded.*

[Parts in 100,000.]

Worcester.

	RESIDUE ON EVAPORATION,						AMMONIA.						Chlorine.		NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.													
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.		Total.	Dissolved.	Suspended.											
Imhoff tank effluent as applied to trickling filters.	62.47	47.33	15.14	14.67	7.92	6.75	2.58	.34	.14	.20	8.55	—	3.96	1.83	.78	—	Trickling filters have an area of 13.68 acres and a depth of 10 feet of stone from 1¼ to 3 inches in size. The average rate of operation was about 1,750,000 gallons per acre per day.				
Effluent from trickling filters.	57.58	46.01	11.57	12.13	7.85	4.28	1.36	.18	.06	.12	8.75	.6068	2.43	1.02	.51	—					
Per cent removed	8	3	24	17	.9	36	47	47	57	40	—	—	39	44	35	—					
Settled effluent from trickling filters as discharged to Blackstone River.	55.53	48.07	7.46	10.93	8.26	2.67	1.48	.14	.05	.09	8.75	.7709	1.87	.90	.40	—					
Per cent removed by secondary settling tanks.	4	—	36	10	—	38	—	22	17	25	0	—	23	12	22	—	Period of sedimentation averaged about 1.9 hours. Tanks cleaned 5 times.				
Per cent removed by trickling filters and secondary settling tanks.	11	—	51	25	—	60	43	59	64	55	—	—	53	51	48	—					

TABLE NO. 5. — *Average Results of Analyses of Monthly Samples of Effluent from Sand Filters.*

[Parts in 100,000.]

CITY OR TOWN.	Free Ammonia.	Total Albuminoid Ammonia.	Chlorine.	NITROGEN AS —		Iron.
				Nitrates.	Nitrites.	
ATTLEBORO ¹	.55	.0705	3.83	1.9245	.0414	.034
BROCKTON ²	.89	.0494	6.08	1.9385	.0119	.335
Clinton ²	1.54	.0918	3.78	.2771	.0066	1.602
Concord ¹	.03	.0204	2.44	1.2722	.0157	.015
Easthampton ¹	.25	.0316	2.63	2.7243	.0427	.023
Framingham (Imhoff)	1.61	.1000	5.62	1.0534	.0110	.663
Framingham (direct)	2.86	.0813	5.39	.2768	.0029	1.385
Franklin	.66	.0736	5.25	1.3482	.0128	.132
GARDNER (Gardner Area) ³	1.98	.1355	6.29	1.8390	.0259	.346
GARDNER (Templeton Area) ²	2.94	.1132	4.27	.5755	.0042	1.235
Hopedale ²	.74	.0473	3.44	2.8427	.0008	.018
Hudson	1.33	.1248	4.38	1.1325	.0206	.425
Leicester ³	1.29	.1452	3.62	.5982	.0186	.215
Marion	.69	.0336	3.07	.2555	.0234	.376
MARLBOROUGH ²	.83	.0511	4.32	1.0123	.0104	.296
Milford	2.03	.0871	5.15	.4576	.0079	.942
Natick	2.60	.0632	5.91	.0396	.0004	.746
North Attleborough ¹	.38	.0193	2.58	.6217	.0059	.161
Northbridge	.73	.0438	2.36	1.0595	.0046	.582
Norwood ²	1.07	.0681	8.24	.3846	.0366	.476
PITTSFIELD ²	1.27	.1043	3.51	.3379	.0110	1.938
Southbridge ²	2.73	.1082	4.99	.0267	.0000	.707
Spencer ¹	.79	.0458	2.98	.1461	.0101	1.576
STOCKBRIDGE ²	.14	.0354	1.33	.5931	.0229	.159
Westborough ²	1.03	.0785	5.16	.1674	.0116	.771

¹ Six samples.² Regular samples from two or more underdrains in one average.³ Four samples.TABLE NO. 6. — *Efficiency of Sand Filters (Per Cent of Free and Albuminoid Ammonia removed).*

[Parts in 100,000.]

CITY OR TOWN.	FREE AMMONIA.			TOTAL ALBUMINOID AMMONIA.			CHLORINE.		Rate of Operation with Even Distribution (Gallons per Acre per Day). ¹
	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	
ATTLEBORO	3.14	.55	82	.56	.0705	87	3.53	3.83	63,000
BROCKTON	2.17	.89	59	.33	.0494	85	5.96	6.08	—
Clinton	2.37	1.54	35	.56	.0918	84	4.24	3.78	56,000
Concord	2.06	.03	99	.38	.0204	95	2.32	2.44	64,000
Easthampton	2.86	.25	91	.51	.0316	94	4.40	2.63	—
Framingham (Imhoff)	4.22	1.61	62	.63	.1000	84	5.68	5.62	47,000
Framingham (direct)	4.14	2.86	31	1.42	.0813	94	6.20	5.39	
Franklin	1.95	.66	66	.23	.0736	68	3.38	5.25	70,000
GARDNER (Gardner Area)	6.20	1.98	68	1.49	.1355	91	6.27	6.29	—
GARDNER (Templeton Area)	2.57	2.94	—	.35	.1132	68	3.51	4.27	—
Hopedale	3.85	.74	81	.43	.0473	89	3.38	3.44	—
Hudson	3.85	1.33	65	.53	.1248	76	4.44	4.38	69,000
Leicester	2.94	1.29	56	.61	.1452	76	3.43	3.62	—
Marion	2.28	.69	70	.56	.0336	94	8.23	3.07	118,000
MARLBOROUGH	3.53	.83	77	.64	.0511	92	5.59	4.32	50,000
Milford	3.45	2.03	41	.38	.0871	77	4.41	5.15	56,000
Natick	3.48	2.60	25	.64	.0632	90	7.17	5.91	62,000
North Attleborough	2.23	.38	83	.28	.0193	93	2.86	2.58	104,000
Northbridge	1.86	.73	61	.29	.0438	85	2.01	2.36	56,000
Norwood	2.99	1.07	64	.85	.0681	92	13.13	8.24	—
PITTSFIELD	2.20	1.27	42	.44	.1043	76	4.02	3.51	110,000
Southbridge	4.34	2.73	37	.73	.1082	85	5.51	4.99	73,000
Spencer	4.89	.79	84	2.41	.0458	98	3.87	2.98	—
Stockbridge	2.51	.14	94	.36	.0354	90	1.52	1.33	—
Westborough	3.26	1.03	68	.73	.0785	89	5.87	5.16	48,000

¹ See also Table No. 7.

TABLE NO. 7. — *Extent of Sewerage Works, Rate of Flow, and Rate of Operation of Sand Filters.*

CITY OR TOWN.	Popula- tion, Census of 1925.	Approxi- mate Length of Sanitary Sewers (Miles).	Approxi- mate Number of House Con- nections.	ESTIMATED QUANTITY OF SEWAGE TREATED (GALLONS PER DAY).			Estimated Average Quantity of Sewage per Connection.	Net Area of Filter Beds (Acres).	Estimated Rate of Operation with Even Dis- tribution (Gallons per Acre per Day).
				Average for Year.	Average for Month of Maximum Flow.	Average for Month of Minimum Flow.			
ATTLEBORO	20,623	36.75	1,644	983,000	1,077,000	771,000	598	15.50	63,000
BROCKTON	65,343	100.09	8,444	3,227,000 ¹	4,059,000	2,354,000	382	—	—
Clinton	14,180	24.72	1,887	1,463,000 ²	1,918,000	1,280,000	775	26.23	56,000
Concord	7,096	9.00	1,340	352,000	458,000	293,000	652	5.48	64,000
Easthampton	11,587	21.06	1,300	—	—	—	—	2.20	—
FITCHBURG	43,609	—	—	4,003,000	4,860,000	2,551,000	—	—	—
Frammingham	21,078	39.50	3,252	1,368,000	1,634,000	984,000	421	29.12	47,000
Franklin	7,055	14.20	813	228,000	352,000	165,000	280	3.24	70,000
GARDNER	18,730	34.02	2,401	—	—	—	—	12.50	—
Hopedale	3,165	7.08	368	169,000 ³	214,000	128,000	—	3.79	—
Hudson	8,130	13.98	1,065	622,000	736,000	501,000	584	9.00	69,000
Marion	1,271	3.93	195	136,000	180,000	84,000	701	1.15	118,000
MARLBOROUGH	16,236	35.77	2,599	1,017,000	1,425,000	628,000	391	20.19	50,000
Milford	14,781	23.58	1,703	523,000 ⁴	602,000	469,000	—	9.30	56,000
Natick	12,871	13.41	1,588	786,000	921,000	634,000	495	12.60	62,000
North Attleborough	9,790	17.23	918	728,000	840,000	638,000	793	7.00	104,000
Northbridge	10,051	15.49	865	670,000	704,000	627,000	775	12.00	56,000
Norwood	14,151	23.14	1,874	—	—	—	—	14.47	—
Pittsfield	46,877	71.51	6,165	4,515,000	4,808,000	4,474,000	732	41.15	110,000
Southbridge	15,489	17.20	1,300	918,000	1,073,000	766,000	706	12.50	73,000
Westborough	6,348	8.79	518	295,000	355,000	288,000	556	6.20	48,000
WORCESTER	192,242	307.93 ⁵	—	23,790,000	27,890,000	19,220,000	—	—	—

¹ Includes an average of 2,768,000 gallons per day to trickling filter and 459,000 gallons to sand filters.² Entire quantity of sewage not treated.³ New development not included in average.⁴ Records questionable. Amount treated by sand filters only.⁵ Includes 70 miles of combined sewers.

TABLE No. 8. — *General Features.*

CITY OR TOWN.	Year of Construction of and Additions to Works.	Depth of Under-drains (Feet).	Distance of Apart of Under-drains (Feet).	Filtering Material.	Attention given to Disposal Works.
ATTLEBORO	1912, 1913	4-7	35	Excellent sand and gravel; found in place	One man all the time; others when necessary.
BROCKTON	1893, 1905, 1908, 1912	5.5	30	Good sand and gravel; found in place	One chemist in charge, foreman, day and night man, more when necessary.
Clinton	1898, 1899	8	60-70	Good sand and gravel; found in place	Two men all the time; others when necessary.
Concord	1899, 1928	none	—	Good sand underlaid with gravel; found in place	One man once a day.
Easthampton	1908	3.5	20-40	Good sand and gravel; largely found in place	One man all the time; others when necessary.
FITCHBURG	1914	—	—	Trickling filter — 10 feet deep	Chemist in charge; 1 foreman, 1 day and 2 night men.
Framingham	1890, 1924	—	—	Good sand and gravel	One man all the time; others when necessary.
Franklin	1915	4.5	26	Good sand and gravel	Very little attention; one man once in a while.
GARDNER (Gardner Area)	1891	5	20	Good sand; handled in construction	One man all the time; others when necessary.
GARDNER (Templeton Area)	1901, 1909	3-4	20-30	Coarse sand; handled in construction	One man all the time; others when necessary.
Hopedale	1900, 1923	3	35-60	Good material — sand and gravel	One man all the time; others when necessary.
Hudson	1904, 1910	5-6	50-100	Good sand and gravel; found in place	Two men all the time; others when necessary.
Leicester	1894, 1928	4	8	Mostly good sand; handled in construction	Very little attention.
Marion	1906	5	—	Mostly good sand; pockets of fine sand and some ledge; largely found in place	One man every day in summer, every other day in winter.
MARLBOROUGH	1891, 1908, 1909, 1910, 1911	4.5-6	30-50	Rather fine sand; found in place	One man all the time; others when necessary.
Milford	1907, 1924	5	40	Rather fine sand; found in place; trickling filter	One man every day; others when necessary.
Natick	1896	6	36	Sand of good quality, but stratified; found in place	One man all the time; others when necessary.
North Attleborough	1909, 1910	5-6.5	55	Coarse sand and gravel; found in place	One man every day; others when necessary.
Northbridge	1906, 1907, 1920	4	50-75	Coarse sand and gravel; mostly handled	Two men all the time; others when necessary.
Norwood	1909, 1918, 1923, 1924	4-6	40	Good sand and gravel; partly handled	One man all the time; others when necessary.
PITTSFIELD	1901, 1915	4	35	Good sand; mostly found in place	Two men all the time; others when necessary.
Southbridge	1908, 1925, 1926	4	40	Fair sand and gravel, considerable quantity handled, some found in place.	One man all the time; others when necessary.
Spencer	1897, 1923	—	—	Good sand and gravel; largely found in place	One man all the time; others when necessary.
Stoughton	1899, 1921, 1922	3-4.5	23	Sand filters, good quality sand	One man all the time.
Westborough	1892, 1911	3-4.5	30	Irrigation area, rather fine sand	One man all the time.
Worcester	1898 ¹ , 1925	5	30-40	Good sand and gravel; handled in construction	One man all the time; others when necessary.
		4-6	35-50	Good sand and gravel; largely found in place	Chemist in charge; several men all the time.
				Trickling filters, sand area not in use	

¹ Only three beds underdrained.² Year of first construction of sand filters. Many additions.³ Sedimentation tanks and sand beds abandoned June, 1925. Imhoff tanks, trickling filters and secondary tanks installed.

EXAMINATION OF SEWER OUTLETS DISCHARGING INTO THE SEA.

The new outfall sewer of the sewerage system of the city of Lynn was completed during the year, and during the latter part of the year most of the sewage of the city was being discharged through the new outfall which is located in deep water at a point southwest of Bass Point, Nahant. The outfall sewers into the sea off Marblehead and Gloucester were also put into operation during the year.

The new outfall sewer of the South Essex Sewerage District was also completed during the year, and the sewage of the municipalities in this district was being discharged through the new outfall at the end of the year.

INVESTIGATIONS RELATIVE TO SHELLFISH.

A plant for the chlorination of shellfish was constructed in Newburyport early in the year and was in operation during the summer. The city has made an additional appropriation, and plans were being prepared toward the end of the year for the construction of a larger plant.

Much attention has been required of the Department in the transplanting of shellfish from contaminated areas about New Bedford to clean waters.

Inspections have been made from time to time at various points along the sea coast, and as a result of these inspections, based also on a large number of analyses, it became necessary during the early part of the summer to close for the taking of shellfish a portion of the waters and flats adjacent to the Ipswich River below Ipswich because of sewage pollution.

As authorized by Chapter 44 of the Resolves of 1928 a special commission was appointed to consider all questions relative to shellfish, and representatives of the Department have conferred with this commission from time to time during the year. The report of this commission was presented to the Legislature of 1929 and is printed as House Document No. 1025.

INVESTIGATION OF THE CONDITION OF THE WATERS OF QUINCY BAY.

An investigation was made by the Department during the year of the condition of the waters of Quincy Bay in the city of Quincy as required by Chapter 12 of the Resolves of 1928. A report of the results of this investigation was presented to the Legislature of 1929 and is printed as Senate Document No. 8 of the year 1929.

INVESTIGATION OF THE CONDITION OF THE MERRIMACK RIVER.

An investigation was made of the Merrimack River in accordance with the provisions of Chapter 26 of the Resolves of 1928, and a report was presented to the Legislature of 1929, which is printed as House Document No. 82.

INVESTIGATION OF SAUGUS RIVER.

An investigation was made during the year by the Department of the pollution of the waters of the Saugus River and its tributaries in Lynn and Saugus in accordance with the provisions of Chapter 9 of the Resolves of 1928. The results of this investigation were presented in a report to the Legislature of 1929 and are printed as House Document No. 151.

INVESTIGATION OF SAVIN HILL BAY, BOSTON.

An investigation was made of the pollution of Savin Hill Bay during the year by the Department co-operating with other commissions as provided in Chapter 39 of the Resolves of 1928. The results of the investigation of the joint commission were presented in a report to the Legislature of 1929 and are printed as House Document No. 185.

INVESTIGATION OF FORT POINT CHANNEL, BOSTON.

The Department also assisted in the investigation of Fort Point Channel as provided in Chapter 23 of the Resolves of 1927. The report of the special commission was presented to the Legislature of 1929 and is printed as House Document No. 1010.

REPORT OF THE DIVISION OF WATER AND SEWAGE LABORATORIES.

H. W. CLARK, *Director.*

This Division, consisting of laboratories in the State House and the Lawrence Experiment Station and its laboratories, carried on its usual volume of analytical and research work during the year 1928. In pursuance of this work the samples as shown in the following table were analyzed chemically, bacterially or microscopically. The results of all these chemical analyses of public water supplies, rivers, sewage applied to and the effluents from municipal sewage disposal areas, etc., are summarized in tables presented in a report of the Division of Sanitary Engineering. Besides the analytical and research work a considerable amount of field work was done during the year in connection with the examination of water supplies, rivers and sewage disposal areas, in studying the action of various waters upon metallic and metal-lined service pipes and also in regard to the effect of cement linings of water pipes in increasing the hardness of certain waters, etc. In several special investigations concerning the condition of the waters of Quincy Bay, the condition of Fort Point Channel, the Merrimack River, etc., this Division cooperated as usual upon all such subjects with the Engineering Division of the Department.

The following table summarizes the analytical work of this Division and a resumé of some of its research work is given on following pages:

State House Laboratories.

Samples from public water supplies:

Surface waters	2,458
Ground waters	1,316
Samples from domestic wells, ice supplies, etc.	604
Samples from rivers	1,180
Samples in connection with special Metropolitan water supply investigation	658
Samples from sewage disposal works:	
Sewages	495
Effluents	672
Samples of wastes and effluents from factories	98
Miscellaneous samples (partial analyses)	135
Sea waters and other samples in connection with Quincy Bay investigation, etc.	275
Microscopical examinations	3,232
Special examinations of water (including field work) for manganese, lead, oil, alkalinity and acidity, fats, dissolved oxygen and carbonic acid	1,793

Lawrence Experiment Station.

Chemical examinations on account of investigations concerning the disposal of domestic sewage and factory wastes, filtration and other treatment of water supplies, swimming pools, etc.	1,486
Mechanical and chemical examinations of sands	119
Samples analyzed for iodine	93
Bacterial examinations of water supplies, rivers, sewage filter effluents, ice, swimming pools, wastes, etc.	2,602
Bacterial examinations in connection with methods of purification of sewage and water	2,063
Bacterial examinations of shellfish and sea waters	1,247

PURIFICATION OF SHELLFISH BY CHLORINE.

During 1927 certain experiments were made with a small plant erected near Plum Island concerning the feasibility of purifying clams bacterially and otherwise by the use of chlorine. These experiments were successful and the method followed and the results of the work were described in the report of this Division for 1927. Only two bushels of clams could be treated daily at this plant hence it was considered best to build a larger plant early in 1928 to study what could

be accomplished along this line on a semi-commercial scale. This plant was constructed by the city of Newburyport acting through its Board of Health. At this plant thirty to fifty bushels of clams could be treated daily. Briefly, the plant constructed near the northern end of Plum Island on the harbor side consisted of a building containing two galvanized iron tanks with a capacity of 1,350 gallons each and each was capable of holding 50 bushels of clams surrounded by the chlorinated water. The plant was also equipped with pumps for pumping water and air, and tanks for the supply of chlorine. The experiments during the previous year had made clear that the clams required a considerable amount of oxygen dissolved in the water if they were to remain alive and active and that the organic matter on their shells and excreted by the clams also absorbed much oxygen. To supply this oxygen vigorous aëration of the water in which the clams were placed was necessary and this was accomplished by pumping air into the water through perforated pipes placed in the bottom of each tank. Analyses of the water in the tanks several hours after the clams had been immersed showed an average increase of .0176 parts in 100,000 of albuminoid ammonia and on a number of occasions when the water was not changed twice daily this organic matter seemed to have an injurious effect on the vitality of the clams. A change of water was also necessary in order that a low enough temperature might be maintained. The temperature of the sea water during July and early August averaged 60° F. when pumped to the tanks but had risen usually to about 70° F. before the tanks were emptied. Chlorine was applied in the form of calcium hypochlorite solution. About 4 parts per million of chlorine were added at the beginning of each run as the organic matter on the clams consumed considerable during the first half hour of treatment. It was intended to maintain always from 0.25 to 0.50 part per million free chlorine in the tank and if a much greater amount than this was present it had a tendency to cause the clams to close, hence stop the circulation of the chlorinated water through them and defeat the purpose of the treatment. Forty-eight hours' treatment was always allowed, one tank being filled with freshly dug clams each day while from the other the treated clams were removed. About fifty runs were made at this plant before it was shut down preparatory to building a plant large enough to handle daily the product of fifty clam diggers. During its period of operation this little plant treated about 1,500 bushels of clams. The results of twenty-four of the runs which were under the complete control of the Experiment Station staff are shown in a following table. It will be noticed that the B. coli score of the polluted clams from the Newburyport flats treated in this plant varied from 50 to 2,086 and that the score of the clams at the end of forty-eight hours' treatment varied from 14 to 46.

Average B. Coli Score of Soft-Shell Clams Before and After Chlorine Treatment.

RUN NUMBER.	Score at Start.	Hours Treated.	Score.	Hours Treated.	Score.
1	52	28	21	48	17
2	12	64	5	106	41
3	2,086	58	24	82	32
4	19	27	22	-	-
5	1,040	18	109	42	32
6	365	29	43	48	38
7	320	24	95	48	17
8	253	24	37	48	9
9	140	24	118	42	35
10	388	15	200	46	29
11	680	22	41	48	28
12	230	38	77	-	-
13	920	24	110	48	32
14	290	24	41	53	50
15	253	27	275	52	46
16	500	24	14	52	28
17	1,850	26	86	52	23
18	185	24	46	50	32
19	50	41	23	49	28
20	185	26	37	52	14
21	140	24	140	55	28
22	275	35	41	48	14
23	365	24	28	58	28
24	230	30	140	48	32

IODINE IN WATER, FOOD AND URINE.

During 1925 and 1926 the iodine in about one hundred of the public water supplies of Massachusetts was determined and the amount found varied from none to 6.33 parts per billion. These results were given quite fully in the last two reports of this Division but a more complete study of iodine in Massachusetts waters and elsewhere was presented in a paper by the Director of this Division published in the Journal of the New England Water Works Association, Vol. XLII, page 204. In all this work attention has been called to the fact that we are not dependent upon water for iodine as many vegetables and grains contain it in large amounts, and sea fish, especially certain species, are great carriers of iodine as are marine growths, seaweeds, mosses, etc. Certain determinations of iodine in food have been made by this Division and by others. Some of this work has been summarized by the Bureau of Fisheries of the United States Department of Commerce and presented in two bulletins issued by that Bureau. Among the determinations of iodine in food made by this Division, the following can be quoted:—

	Iodine (Parts per Billion).
Soft-shell clams	1,012
	1,152
	197
Quahaugs	130
	205
Flour	16
	9
Fresh codfish	1,056
	946
Milk	17

It will be noticed how great is the iodine content of these foods compared with the iodine content of the Massachusetts water containing the greatest amount, namely, 6.33 parts per billion. As all these results made it evident that water furnishes only a small part of the iodine requirements of the human body, it was decided to make some determinations of the excretion of iodine in order to show the comparative amounts taken in in water and the amounts excreted, and during 1928 forty-eight analyses were made of the urine of different individuals. The highest amount of iodine found in urine was 210 parts per billion and the lowest 5 parts, the average amount being 41 or six times the amount found in the richest iodine-bearing water of the State. It was also found that there was a great variation in the amount of iodine in different samples from these individuals, the results from some being uniformly higher than the amount in the urine from others and it was also noticed that the amount of iodine found was lower during warm weather. The average amount in the urine from seven people during April, May, October and November was 66 parts per billion and during June, July and September 28 parts per billion. When this work was begun it was found that there was no adequate or reliable method for the determination of iodine in urine but the following method was developed at the Experiment Station.

Method.

In the determination of iodine all organic matter in a sample must be destroyed and owing to the large amount in urine the determination of iodine is much more difficult than this determination in a sample of water. The usual method of burning the organic matter with oxygen presented so many difficulties that a different procedure was tried as follows: After evaporating 2,500 to 4,000 cubic centimeters of urine with 10 grams of caustic soda to thick syrup this body was transferred to a small iron pan, about 20 grams more of caustic soda added and the mixture heated slowly until fumes ceased to come off. This destroyed most of the organic matter at a comparatively low temperature. The resulting black clinker was ground in a laboratory hand-mill and allowed to stand over night in a beaker with about 200 cubic centimeters of alcohol to extract the iodides; the alcohol was then decanted through a filter, the residue washed by decantation several

times with alcohol and finally placed upon the filter and again thoroughly washed with alcohol. A large part of the alcohol of the filtrate was then distilled off, the residue evaporated nearly to dryness with 3 grams of caustic soda in a nickel dish, the dish then heated slowly until the organic matter extracted had been broken up, the volatile portion driven off and the remainder present as free carbon. The fusion was then dissolved, filtered and evaporated to a small volume and a drop or two of approximately 10th normal arsenious acid added to reduce the iodates. The solution was then acidified with sulphuric acid, transferred to a separatory funnel and a few drops of strong sulphuric acid saturated with sodium nitrite added to liberate any iodine present. The iodine was then extracted with purified carbon tetrachloride and the amount present determined by comparison with a standard solution of iodine in carbon tetrachloride in a Dubosq colorimeter. This procedure gave check results on duplicate samples and showed an average recovery of 75 per cent on known amounts of potassium iodide added to urine and carried through the regular procedure. This might appear to be a low recovery but it must be understood that the amount of iodine in the average urine analysis was only about 0.02 of a milligram or 0.00002 gram.

SLUDGE DIGESTION AND pH CONTROL.

Experiments have been made on this subject at the Station during the past three years in receptacles of various sizes ranging from gallon bottles to experimental two-story digestion tanks having a capacity of from 300 to 1,250 gallons. Thirty-five sludge digestion bottles and seven Imhoff tanks have been operated in connection with this work. The first experiments were made with Lawrence sewage and Lawrence sludge and mixtures of such sludge with industrial sludge and sewage sludge.

In these first experiments nine bottles were operated: No. 1 as a control; No. 2, with the addition of precipitated calcium carbonate; No. 3, with the addition of acetic acid daily; No. 4, with hard sewage; Nos. 5 and 6 contained 1 per cent of industrial sewage sludge mixed with domestic sewage sludge; to No. 7, sodium nitrate equivalent to 2.5 parts in 100,000 of nitrogen was added; to No. 8, 200 cubic centimeters of a well-nitrified sewage effluent daily; No. 9 was a duplicate of No. 1 except it was operated at a low temperature. Fermentation began immediately in all bottles and the rate of production of total gas was determined together with the amounts of methane and carbon dioxide in this gas. Carbon dioxide in solution was also determined. Some of the results were as follows: (1) Fermentation began immediately in all of the bottles irrespective of the pH maintained; (2) there were no progressive stages of digestion; (3) the uncontrolled sludge bottle, the pH of which was 6.5 produced more gas and at a higher rate from the start than did the bottle controlled by calcium carbonate, the pH of which was 7.0. The sludge bottle to which acetic acid was added, lowering the pH to an average of 6.0, gave the largest volume of gas and the largest volume of methane; in fact, bacterial activity and digestion were apparently aided by the addition of acetic acid. Sludge bottle No. 7, which received sodium nitrate, showed the greatest sludge destruction and the uncontrolled sludge bottle No. 9, kept at a low temperature, the second greatest. It was shown by this work that as the sludge ripens and digestion progresses the pH rises due quite largely to calcium carbonate released by the destruction of the organic matter of the sludge by gasification in much the same way as if the sludge were actually burned. The sludge in these first experiments contained 1.26 per cent calcium carbonate and .56 per cent magnesium carbonate. The sewage applied to the sludge bottles contained calcium as carbonate equivalent to 3.98 parts in 100,000. The effluent from bottle No. 1 contained 0.09 parts calcium carbonate in 100,000 and the effluent of bottle No. 9, 11.5 parts. In Imhoff tanks with less circulation the tendency is for the calcium carbonate to accumulate and raise the pH and this is true with the two Imhoff tanks of 1,250 gallons' capacity at the Station. These tanks have been in good operation for nearly three years and the pH of the sludge has gradually increased from 6.8 during the first year to 7.2 at the present time without the introduction of any lime except that naturally present in the entering sludge and sewage.

Early in 1928 sludge from four other Massachusetts cities was digested under similar conditions. The object of these studies was primarily to observe the effect of pH control and to compare the action of sludge from different municipalities when digested under the same condition. Sludge collected from the inlet end of settling tanks at Clinton, Marlborough, Fitchburg and Brockton was mixed with equal amounts of well digested sludge from an Imhoff tank in good operation at the Experiment Station and the analyses showed that the total amount of solid matter in each bottle was 62.2 grams. Three bottles of each sludge were studied. In the first, the pH was uncontrolled; in the second the pH of the 200 cubic centimeters of sewage added daily was reduced to 5.3 with sulphuric acid; to the third, precipitated CaCO_3 was added at intervals. Sewage was added to the bottles partly with the idea of gradually removing the products of digestion and partly to furnish samples for examination. Apparently this added sewage had little effect on digestion. Gas analyses were made frequently enough for the results to represent closely the composition of the total gas formed. The pH of and the dissolved carbon dioxide in the liquid forced from each bottle were determined and the amount of CO_2 dissolved in this liquid was calculated as gas and added to the amount measured as gas. In all, thirteen sludge digestion bottles were operated in this second study, — twelve as described in a previous report, the thirteenth as described by other investigators; that is, no sewage was added to it during the period of operation but CaCO_3 was. During the first four weeks of these experiments the bottles were kept at an average temperature of about 60° F. The bottles were then moved to a small room which was kept at a temperature of about 80° F. A table showing the results of these experiments follows, this table presenting the pH of the sludge experimented with from the different cities, also the pH of the sewage applied to and the effluents of all these bottles, the method of operation, the cubic centimeters of gas formed per gram of organic matter and the period of operation.

Comparison of Action of Sludge of Different Municipalities.

BOTTLE No.	Sludge.	pH.			CaCO_3 added (Grams).	GAS PER GRAM OF ORGANIC MATTER.		Time of Digestion (Days).
		Applied.	Effluent.	Method of Operation.		CO_2 (Cc.).	Methane (Cc.).	
16	Clinton, pH 5.4	6.8	6.4	Uncontrolled	0	74	183	66
17		5.3	6.2	Acid added	0	83	174	66
18		6.8	6.6	CaCO_3 added	11	70	222	73
19	Marlborough, pH 5.2	6.8	5.8	Uncontrolled	0	37	60	66
20		5.3	5.8	Acid added	0	31	37	110
21		6.8	6.4	CaCO_3 added	19	91	312	110
22		—	6.7	CaCO_3 added	11	77	295	110
23	Fitchburg, pH 5.4	6.8	6.0	Uncontrolled	0	89	179	110
24		5.3	5.9	Acid added	0	59	77	73
25		6.8	6.3	CaCO_3 added	19	87	205	92
31	Brockton, pH 5.4	6.8	5.4	Uncontrolled	0	9	22	66
32		5.3	5.2	Acid added	0	11	26	134
33		6.8	6.2	CaCO_3 added	19	64	156	121

It will be seen from a study of this table that Clinton sludge had a pH of 5.4, Marlborough 5.2, Fitchburg 5.4 and Brockton 5.4 and observations seem to show that all these sludges contained organic acid. Lawrence sludge has a pH invariably above 6 and is apparently acid simply from the presence of carbonic acid. Every experiment was continued until digestion appeared to be complete, in other words until fermentation apparently ceased, the period of operation varying from 66 to 134 days. In none of the bottles even in those to which calcium carbonate in considerable amounts was added did the pH reach 7. In the bottles to which acid was added fermentation and digestion were undoubtedly impeded but it was evident that the Clinton sludge contained considerable available alkalinity as a bottle of this sludge even with the addition of acid maintained a pH considerably higher than similar bottles operated with sludge from the other three municipal-

ities. Also the Clinton bottle operated with uncontrolled pH reached a higher point in this respect than the uncontrolled bottles of sludge from the other municipalities. It was noticeable that the pH of the uncontrolled sludge bottles increased steadily during the period of experiment; in the case of Clinton sludge from 6.3 to 6.6; with Marlborough sludge from 5.5 to 6.1; with Fitchburg sludge from 5.9 to 6.3, and with Brockton sludge from 5.4 to 6.0. A study of the table shows clearly the different behavior of these sludges under similar conditions. Clinton sludge fermented under all three conditions with a large production of gas per gram of sludge and digestion was entirely satisfactory. Marlborough sludge needed the addition of CaCO_3 for good fermentation and digestion. Fitchburg sludge digested well with or without the addition of CaCO_3 while Brockton sludge remained almost quiescent in all three bottles for more than two months but finally fermentation and digestion began at the end of seventy days in the bottle to which CaCO_3 was added. Again we did not obtain even in the bottle operated as described by Fair,¹ characteristic progressive stages of fermentation although fermentation in this bottle and one other approached this condition. The conclusions to be drawn from these second bottles of experiments are (1) sludge from different municipalities behaves very differently under the digestion conditions; (2) this difference is inherent in the organic and mineral matter of each sludge, the proportion of different bodies in each sludge not being the same; that is, the chemical composition of the sludge is a large factor in digestion; (3) addition of CaCO_3 is an aid in accelerating sludge digestion in certain instances. More was added in these experiments than would go into solution, however, and yet the pH was in no instance increased to 7.0; (4) the sludge from certain municipalities has an available alkalinity that makes the addition of CaCO_3 unnecessary and there is always, as already noted in a previous report, a slow accumulation of lime in the sludge; (5) we have spoken of pH control. As a matter of fact, however, we were not able even with the addition of calcium carbonate to control the pH as desired, as this carbonate did not go into solution fast enough to offset the acids, — organic, carbonic, etc., in the sludge and sewage. The pH of digesting sludge can always be raised by removing the CO_2 in solution by aëration. We have raised it from 6 to 6.8 in this way; (6) finally, too much weight should not be placed on individual experiments of this kind. There are so many uncontrollable factors which enter into experiments dealing with living organisms that wide variations are likely in experiments conducted under apparently identical conditions; (7) organic acids resulting from the decomposition of sludge may, while causing low pH, be beneficial in digestion.

INDUSTRIAL WASTES.

As usual this Division did much work in regard to the treatment and disposal of wastes from industrial plants and in investigating complaints concerning such plants due to disagreeable odors, etc., coming from them.

CHARACTER OF THE SEWAGE USED IN INVESTIGATIONS UPON SEWAGE PURIFICATION.

The following tables present the average analyses of sewage used during the year. "Regular sewage" is the average of the sewage as pumped to the Station; "settled sewage" is the sewage applied to all tanks and filters except Filters Nos. 1, 4 and 9A and is regular sewage after passing through Imhoff tanks Nos. 544 and 545 and receiving a slight additional settling in a large tank supplying the various filters; the "sewage applied to Filters Nos. 1, 4 and 9A" is the combined effluents from Imhoff tanks Nos. 544 and 545 without any further settling.

¹ Journal of the Boston Society of Civil Engineers, Feb., 1927, p. 91.

Average Analyses.

Regular Sewage.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.						
	Total.	In Solution.	Total.	In Solution.			
4.05	.84	.50	1.42	.88	7.2	4.44	1,100,000
Settled Sewage.							
3.70	.60	.40	1.08	.69	6.5	3.58	1,660,000
Sewage applied to Filters Nos. 1, 4 and 9A.							
3.89	.48	.34	0.91	.58	7.0	3.09	1,100,000
Effluent from Imhoff Tank No. 544.							
3.63	.46	.32	0.90	.56	7.0	3.23	1,040,000
Effluent from Imhoff Tank No. 545.							
4.15	.49	.35	0.91	.60	7.0	2.94	1,180,000

Average Solids.

Regular Sewage.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
58.1	26.3	31.8	40.7	15.5	25.2	17.4	10.8	6.6
<i>Settled Sewage.</i>								
47.6	20.7	26.9	37.3	15.6	21.7	10.3	5.1	5.2
<i>Sewage applied to Filters Nos. 1, 4 and 9A.</i>								
45.1	18.4	26.7	37.2	13.5	23.7	7.9	4.9	3.0
<i>Effluent from Imhoff Tank No. 544.</i>								
45.1	18.8	26.3	37.2	13.7	23.5	7.9	5.1	2.8
<i>Effluent from Imhoff Tank No. 545.</i>								
45.0	18.0	27.0	37.2	13.4	23.8	7.8	4.6	3.2

IMHOFF TANKS.

During 1928 the two Imhoff tanks Nos. 544 and 545 were continued in operation. These tanks are constructed of concrete, 20 feet deep with settling compartments 7 feet 4 inches long and 1 foot wide and with gas vents one foot square at each end of these compartments. The bottoms of the settling compartments have a 45° slope towards the center where there is a slot opening.

The settling compartment of tank No. 544 has a capacity of 275 gallons and the digestion chamber 955 gallons while with tank No. 545 these proportions are reversed, the settling compartment holding 715 gallons and the digestion chamber 357 gallons. During 1928 the volume of sewage passing through each tank averaged 1,239 gallons daily, giving a theoretical detention of 1.3 hours in the settling compartment of tank No. 544 and 3.2 hours in that of No. 545. In each tank settleable solids have been removed from this sewage and accumulated in the digestion chambers at the rate of 791 and 800 pounds, respectively, of dry matter per million gallons of sewage.

The effluents of these two tanks are pumped to a storage tank for distribution to the various filters. One hundred forty-six pounds of dry matter per million gallons of sewage were deposited in this storage tank during the year. This sludge contained 3.26 per cent of nitrogen, 29.3 per cent of fatty matters and on ignition

lost 63 per cent of its weight. The average temperature at the top of the tanks has been 54° F. and at the bottom, 52° F. The maximum temperature was 74° F. during August.

There has been a quiet fermentation in both tanks with no foaming. The digested sludge as drawn from the tanks has contained from 8 to 10 per cent of dry matter, has been inoffensive and has had a pH of 7.0.

The following table gives the results of analyses of the digested sludge:

SLUDGE FROM —	Nitrogen (Per Cent).	Fats (Per Cent).	Loss on Ignition (Per Cent).
Tank No. 544	3.18	14.4	40.9
Tank No. 545	2.98	12.9	54.5

OPERATION OF HOUSEHOLD SEPTIC TANKS.

Two small septic tanks of the household type have been operated at the Station since June, 1920. These tanks are of concrete construction and are designated as Nos. 507 and 508. The first tank is 4 feet long, 2 feet wide and 40 inches deep, with a sloping bottom and a capacity of 185 gallons; the second is constructed as the first but consists of two compartments and has a total capacity of 370 gallons. Sewage enters each tank through trapped inlets and discharges through a pipe reaching fifteen inches below the surface of the sewage in the tank. A baffle is placed one-third of the distance from the inlet to the outlet and reaches to within eight inches of the bottom of the tank. The first tank receives fresh household sewage and the second, Lawrence sewage which is a comparatively stale sewage. Both tanks are so operated that theoretically the sewage is held within each for two days. During almost the entire period of operation the effluents from both tanks have been remarkably clear and comparatively odorless, although a slight hydrogen sulphide odor has been noted occasionally. Both tanks have been opened for observation and sludge measurements have been made five times since 1920 and results in regard to this have been given in previous reports. These tanks perform the partial purification of sewage expected of them but are not — neither is any septic tank which has been studied by this Division — such efficient destroyers of bacteria as is often claimed by those who are interested in their commercial installation. The following table gives the total number of bacteria per cubic centimeter in the entering sewage and their effluents, and a later table presents the average number of *B. coli* in their effluents. The accumulation of sludge in these tanks became so great during 1928 that all but six inches in depth was removed in August.

Average Analyses.

Fresh Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000.]

Free.	AMMONIA.		KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
	ALBUMINOID.						
	Total.	In Solution.	Total.	In Solution.			
3.75	.73	.46	1.31	.83	4.6	4.52	1,600,000
Effluent from Closed Septic Tank No. 507.							
3.73	.40	.28	0.67	.48	4.4	2.56	810,000
Regular Sewage applied to Closed Septic Tank No. 508.							
3.23	.67	.45	1.13	.85	6.4	3.63	1,400,000
Effluent from Closed Septic Tank No. 508.							
2.85	.32	.23	0.56	.42	5.7	2.19	700,000

Average Solids.

Fresh Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
46.9	24.8	22.1	30.5	13.8	16.7	16.4	11.0	5.4
<i>Effluent from Closed Septic Tank No. 507.</i>								
32.3	14.2	18.1	27.3	11.4	15.9	5.0	2.8	2.2
<i>Regular Sewage applied to Closed Septic Tank No. 508.</i>								
52.3	24.6	27.7	37.8	15.2	22.6	14.5	9.4	5.1
<i>Effluent from Closed Septic Tank No. 508.</i>								
35.9	13.9	22.0	31.4	11.5	19.9	4.5	2.4	2.1

ACTIVATED SLUDGE PROCESS.

Experiments on the aëration of sewage have been carried on at the Experiment Station continuously since 1912 and descriptions and results of the various tanks have been published in the annual reports of the Department. Activated sludge tank No. 485, started in 1917, is still in operation. It consists of three compartments 75 inches deep, each holding 230 gallons and the sewage flows continuously through these compartments. The overflow from the last, comprising the purified sewage with considerable sludge passes through two settling tanks of 600 and 160 gallons' capacity, respectively, allowing seven hours' sedimentation during which the activated sludge settled out and is then pumped back to the first compartment of No. 485. Air is applied at the bottom of each compartment through a filtros plate clamped to the top of an iron box at a rate of approximately .5 cubic foot of air per gallon of sewage. The tank is operated at the rate of 7,500,000 gallons per acre daily and this rate is dependent largely on the depth of the tank, as a given amount of air will be equally effective on a much deeper tank. It has been the custom to retain about 20 per cent by volume of sludge in the tank, the excess being pumped to waste from time to time. During the year this surplus was at the rate of 532 pounds of dry sludge per million gallons of sewage treated.

The sewage applied to this tank had passed through an Imhoff tank and then received some settling in the supply tank. By the preliminary settling and activated sludge process 1,473 pounds of suspended solids per million gallons of sewage were removed. The dry activated sludge examined during the year contained 5.2 per cent nitrogen and 4.7 per cent fats. The effluent of the tank has been clear, stable and well nitrified.

Average Analyses.

Sewage applied to Activated Sludge Tank No. 485.

[Parts in 100,000.]

APPEARANCE.		AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	NITROGEN AS —		Oxygen consumed.	Bacteria per Cubic Centimeter.
Turbidity.	Color.	Free.	ALBUMINOID.		Total.	In Solution.		Nitrates.	Nitrites.		
-	-	3.80	.63	.37	1.09	.69	6.8	-	-	3.42	1,660,000
<i>Effluent from Activated Sludge Tank No. 485.</i>											
0.2	1.5	1.46	.13	.09	0.25	.18	6.2	.76	.0590	1.01	31,000

*Average Solids.**Sewage applied to Activated Sludge Tank No. 485.*

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
47.9	20.5	27.4	31.9	10.5	21.4	16.0	10.0	6.0
<i>Effluent from Activated Sludge Tank No. 485.</i>								
37.3	13.4	23.9	35.5	12.6	22.9	1.8	0.8	1.0

INTERMITTENT SAND FILTERS. — FILTERS NOS. 1, 4 AND 9A.

Each of these three filters is 1/200 of an acre in area and at the end of the year Nos. 1 and 4 had been operated forty-one years and No. 9A, thirty-eight years. Up to January, 1926, these filters had received regular sewage without preliminary settling. For the last three years, the sewage applied has been passed through an Imhoff tank where some of the suspended solids were removed. Filters Nos. 1, 4 and 9A were operated at rates of 48,400, 20,400 and 47,500 gallons per acre daily, respectively, during 1928. For many years these filters have been operated at such rates that the amount of organic matter stored in them remains practically stationary. This stored organic matter is being constantly acted on by the bacteria and at times the amount of such matter has shown an actual decrease. Sand analyses for 1925, 1926 and 1928 are shown in a following table. Variations from year to year in the upper eighteen inches are partly accounted for by the trenching and ridging operations.

Filter No. 1 is constructed of 5 feet in depth of sand of an effective size of 0.48 millimeter and Filter No. 4 of 5 feet in depth of sand of an effective size of 0.04 millimeter. The surface of this filter, moreover, is permanently arranged in circular trenches 14 inches wide which are filled to a depth of twelve inches with sand of an effective size of 0.48 millimeter and sewage is applied to these trenches. Filter No. 9A is constructed of 5 feet in depth of sand of an effective size of 0.17 millimeter.

The surface of Filters Nos. 1 and 9A are trenched and ridged late in the fall, board coverings being placed over these trenches and the trenches on Filter No. 4.

*Average Analyses.**Effluent from Filter No. 1.*

TEMPERATURE (DEGREES F.).		Quantity Applied— Gallons per Acre Daily.	AMMONIA.		Chlorine.	NITROGEN AS —		Oxygen con- sumed.	Bacteria per Cubic Centimeter.
Applied.	Effluent.		Free.	Total Albumi- noid.		Nitrates.	Nitrites.		
60	53	48,400	.5076	.0554	5.7	1.76	.0008	.52	7,450
<i>Effluent from Filter No. 4.</i>									
60	53	20,400	.0405	.0199	5.3	1.80	.0009	.32	750
<i>Effluent from Filter No. 9A.</i>									
60	55	47,500	.4247	.0378	4.5	1.19	.0012	.39	3,900

Albuminoid Ammonia in Sand Filters Nos. 1 and 9A.

	FILTER NO. 1.			FILTER NO. 9A.		
	1925.	1926.	1928.	1925.	1926.	1928.
Average of first 12 inches	83.0	86.4	148.0	42.2	56.2	68.3
Average at 18 inches	68.2	37.0	14.4	22.4	33.0	6.1
Average at 24 inches	20.8	26.4	14.3	8.7	12.3	4.7
Average at 36 inches	11.3	10.1	4.6	5.9	7.6	5.3
Average at 48 inches	11.4	4.2	3.7	5.6	5.6	4.5
Average at 60 inches	6.1	5.1	1.8	4.2	6.8	5.1

TRICKLING FILTERS.

Trickling, or sprinkling filters, are in use at many municipalities both in this country and abroad and are on the whole the favorite method for the disposal and purification of large volumes of sewage. They have been studied at the Station in different forms and operating in different ways since 1892. During 1928 eight such filters were in operation there. Filter No. 135, constructed of 10 feet in depth of broken stone was started twenty-nine years ago; Filters Nos. 452, 453, 454 and 455 were put in operation in May, 1914, and are constructed of 4, 6, 8 and 10 feet in depth, respectively, of crushed stone that will pass a $\frac{1}{2}$ -inch screen and be retained by a $\frac{3}{4}$ -inch screen; Filters Nos. 473, 474 and 475 are constructed of 6, 8 and 10 feet in depth, respectively, of a coarser broken stone all of which will pass a 3-inch screen, and be retained by a $\frac{1}{2}$ -inch screen. These filters were started in April, 1915. Attempts are made to so operate all these filters of different depths at such a rate that their effluents will be approximately the same; that is, as regards organic matter, nitrification, etc. This was accomplished fairly well during 1928 as shown by a following table giving the average analyses of the effluent from each during the year and the rates of operation. A study of this table will make clear the fact, as has been stated frequently in these reports, that the deeper filters can receive sewage at a rate much greater than would be expected by comparison of their depths. For instance, Filter No. 455, 10 feet in depth, was operated during the year at a rate somewhat more than four times as great as that of Filter No. 452 constructed of the same material and 4 feet in depth and with slightly better purification results not only in the removal of organic matter but of bacteria. The same statement holds true of Filters Nos. 475 and 473, 10 feet and 4 feet in depth, respectively.

Average Analyses.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.

[Parts in 100,000.]

FILTER NUMBER.	Quantity Applied. — Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen. consumed.	Bacteria per Cubic Centimeter.
		Free.	ALBUMINOID.				Nitrates.	Nitrites.		
			Total.	In So- lution.						
135	1,460,000	1.93	.34	.20	.59	6.5	1.49	.0160	2.34	650,000
452	787,000	2.05	.41	.23	.75	6.4	1.26	.0795	2.67	500,000
453	984,000	2.61	.41	.23	.71	6.4	1.27	.0275	2.59	400,000
454	1,521,000	1.45	.37	.22	.68	6.2	1.83	.0435	2.13	200,000
455	3,432,000	1.98	.35	.20	.68	6.4	1.44	.0560	2.29	140,000
473	489,000	2.23	.37	.21	.63	6.4	0.75	.1325	2.33	600,000
474	1,465,000	2.35	.35	.20	.61	6.5	0.43	.1375	2.21	310,000
475	3,432,000	1.66	.37	.26	.71	6.6	1.34	.0790	2.42	420,000

Average Solids.

Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.

[Parts in 100,000.]

FILTER NUMBER.	UNFILTERED.			FILTERED.			IN SUSPENSION.		
	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
135	50.3	21.9	28.4	41.6	17.6	24.0	8.7	4.3	4.4
452	53.8	24.4	29.4	41.5	16.4	25.1	12.3	8.0	4.3
453	49.1	20.7	28.4	37.3	14.4	22.9	11.8	6.3	5.5
454	54.8	25.7	29.1	44.0	20.2	23.8	10.8	5.5	5.3
455	47.4	21.3	26.1	38.6	16.4	22.2	8.8	4.9	3.9
473	44.7	19.1	25.6	35.0	14.4	20.6	9.7	4.7	5.0
474	40.7	14.8	25.9	34.0	10.8	23.2	6.7	4.0	2.7
475	47.9	20.7	27.2	37.8	14.6	23.2	10.1	6.1	4.0

OPERATION OF CONTACT FILTERS.

Only one contact filter, No. 175, is now in operation as a study of the permanency of this type of filter and as an example of this method of sewage purification. It was started in 1901, is 1/20,000 of an acre in area and contains 39

inches in depth of coke passing a 1-inch screen and retained on a $\frac{1}{4}$ -inch screen. During 1928 the filter was operated one five-hour cycle daily with sewage which had passed through an Imhoff tank and received a small amount of settling in a storage supply tank. It was rested one week on four occasions during the year. The effluent was clear, well nitrified and always stable. Since 1901 it has been necessary to remove and wash the filtering material twice, once in 1911 and again in 1920. Since 1920 the open space has decreased 28 per cent.

Average Analyses.

Effluent from Contact Filter No. 175.

[Parts in 100,000.]

Quantity Applied. — Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen consumed.	Bacteria per Cubic Centimeter.
	Free.	ALBUMINOID.				Nitrates.	Nitrites.		
		Total.	In Solution.						
308,000	.93	.27	.18	.47	6.5	1.50	.1063	1.78	330,000

Average Solids.

Effluent from Contact Filter No. 175.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
44.8	18.2	26.6	40.3	16.9	23.4	4.5	1.3	3.2

B. COLI CONTENT OF SEWAGE AND EFFLUENTS, 1928.

The following table presents figures showing the average number of B. coli per cubic centimeter in the sewage used at the Experiment Station and in the effluents of various tanks and filters. The great reduction of B. coli by the sand filters is, as always, very striking as is also that by the activated sludge tanks. The poor bacterial character of the effluent from septic tanks Nos. 507 and 508 is clearly shown.

	B. Coli per Cubic Centimeter.
Regular Sewage	85,000
Settled Sewage ¹	85,000
Sewage applied to Filters Nos. 1, 4 and 9A	82,000
Effluent from Imhoff Tank No. 544	82,000
Effluent from Imhoff Tank No. 545	82,000
Effluent from Intermittent Sand Filter No. 1	532
Effluent from Intermittent Sand Filter No. 4	1.5
Effluent from Intermittent Sand Filter No. 9A	37
Effluent from Trickling Filter No. 135	10,000
Effluent from Trickling Filter No. 452	33,000
Effluent from Trickling Filter No. 453	10,000
Effluent from Trickling Filter No. 454	10,000
Effluent from Trickling Filter No. 455	10,000
Effluent from Trickling Filter No. 473	40,000
Effluent from Trickling Filter No. 474	33,000
Effluent from Trickling Filter No. 475	10,000
Effluent from Contact Filter No. 175	10,000
Effluent from Activated Sludge Tank No. 485	1,000
Effluent from Activated Sludge Tank No. 449D	1,000
Fresh Sewage applied to Septic Tank No. 507	100,000
Effluent from Septic Tank No. 507	82,000
Settled Sewage applied to Septic Tank No. 508	100,000
Effluent from Septic Tank No. 508	70,000

¹ Applied to Activated Sludge Tank No. 485.

LAWRENCE CITY FILTERS.

As usual this report presents data in regard to the operation of the slow sand filters for the purification of the water supply of the city of Lawrence. Lawrence has taken its water supply from the Merrimack River since 1875 and since 1893 it has been filtered. Since 1918 the filtered water has been treated with chlorine

as an added factor of safety. Three filters are in use. The oldest, 2.2 acres in area, is divided into three sections, one of which is of the usual concrete construction; that is, covered and with a comparatively tight, concrete bottom. The remaining two sections are simply a bed of sand with gravel and pipe underdrains placed upon the natural earth bottom. The second filter, 0.75 of an acre in area, was built in 1907 and is covered. The third filter, 0.75 of an acre in area, is covered also and was completed early in 1926.

The average volume of water filtered daily during 1928 was 4,628,509 gallons, about 9 per cent less than during 1927, due to the continued industrial depression. Liquid chlorine was applied at the pump-well at an average rate of 1.29 parts per million. This amount of chlorine is high compared with the amount used in other localities but is necessary. There have been no complaints about chlorine tastes or odors on the low service which supplies the greater part of the city from the reservoir but owing to the arrangement of the pump intakes and chlorine supply, the high service standpipe occasionally receives an excess of chlorine and some complaints have been received. One remedy for this condition would be to pump to the high service standpipe directly from the reservoir as the thorough mixing and storage that the reservoir affords undoubtedly eliminates all chlorine tastes and odors.

The following tables present the results of bacterial and chemical analyses and, as has often been stated in these reports, much iron-bearing ground water comparatively high in chlorine becomes mixed with the effluent of these filters, and this iron producing turbidity, the staining of bath-room fixtures, etc., is the chief ground of complaint of Lawrence citizens in regard to this supply.

Average Bacterial Analyses.

Merrimack River. — Intake of the Lawrence City Filters.

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 cc.
4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		.001 cc.	.01 cc.	0.1 cc.	1.0 cc.	10 cc.	
	Total.	Red.		Total.	Red.						
4,700	210	58	—	—	—	0	36	94	100	100	4,200
<i>Effluent from Lawrence City Filter (Old Filter, East Open Section).</i>											
240	5	0	94.8	97.6	100.0	—	—	—	2	28	5
<i>Effluent from Lawrence City Filter (Old Filter, East Covered Section).</i>											
110	4	0	97.7	98.1	100.0	—	—	0	4	27	6
<i>Effluent from Lawrence City Filter (Old Filter, West Open Section).</i>											
190	3	0	96.0	98.6	100.0	—	—	0	6	37	9
<i>Effluent from Lawrence City Filter (Filter, 1907).</i>											
8	2	0	99.8	99.1	100.0	—	—	0	0	2	—1
<i>Effluent from Lawrence City Filter (New Filter, 1925).</i>											
101	7	1	97.9	96.7	98.3	—	—	0	9	37	12
<i>Mixed Effluents as pumped to Distributing Reservoir after Chlorine Treatment.</i>											
17	2	0	99.6	99.1	100.0	—	—	0	0	1	—1
<i>Water from Outlet of Distributing Reservoir.</i>											
79	7	0	98.3	96.7	100.0	—	—	0	0	6	—1
<i>Water from a Tap at Lawrence City Hall.</i>											
63	3	0	98.7	98.6	100.0	—	—	0	0	2	—1
<i>Water from a Tap at the Lawrence Experiment Station.</i>											
54	3	0	98.9	98.6	100.0	—	—	0	0	2	—1
<i>Water from a Tap on the High Service System.</i>											
21	2	0	99.5	99.1	100.0	—	—	0	0	1	—1

¹ Less than 1.

Average Chemical Analyses.
Merrimack River. — Intake of the Lawrence City Filter.

[Parts in 100,000.]

Color.	AMMONIA.			Chlorine.	NITROGEN AS —		Oxygen con- sumed.	Iron.	Hardness.
	Free.	ALBUMINOID.			Nitrates.	Nitrites.			
		Total.	In Solution.						
.44	.0095	.0193	.0150	.33	.017	.0007	.57	.0818	1.8
Effluent from the Lawrence City Filter.									
.32	.0070	.0083	—	.38	.028	.0003	.39	.0700	1.8
Water from Outlet of Distributing Reservoir.									
.39	.0077	.0087	—	.45	.025	.0003	.37	.1027	2.0
Water from a Tap at Lawrence City Hall.									
.38	.0052	.0086	—	.45	.033	.0003	.37	.0985	2.1
Water from a Tap at the Lawrence Experiment Station.									
.37	.0035	.0079	—	.45	.031	.0003	.37	.0995	2.1

Average Solids.

Merrimack River. — Intake of the Lawrence City Filter.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
5.91	2.33	3.58	5.30	2.07	3.23	.61	.26	.35
<i>Effluent from Lawrence City Filter.</i>								
5.37	2.03	3.34	—	—	—	—	—	—

MECHANICAL FILTRATION OF WATER.

During the year Filter No. 520, a complete filter of the mechanical type, was operated at the comparatively low rate of 61 million gallons per acre daily. The average length of run was 18.86 hours as compared with 17.22 hours in 1927 and the percentage of wash-water was reduced to 2.81 as compared with 3.08 in 1927. The physical characteristics of the effluent were satisfactory, the color averaging .01 but its B. coli content was greater than the U. S. Treasury standard of two in one hundred cubic centimeters in about 30 per cent of all samples, averaging three for the year. This was, however, a reduction of the B. coli content of the river water applied of 99.87 per cent. The effluent, moreover, did not satisfy the proposed modification of the U. S. Treasury standard which calls for an average of not more than one B. coli in one hundred cubic centimeters but allows 5 per cent of the samples tested to contain six B. coli in one hundred cubic centimeters. In every sample tested where the present limit of two per hundred cubic centimeters was exceeded, more than six B. coli per hundred cubic centimeters were found.

Average Bacterial Analyses.

Merrimack River Water applied to Mechanical Filter No. 520.

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			B. Coli in 100 cc.
4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		
	Total.	Red.		Total.	Red.	
1,800	150	48	—	—	—	2,900
<i>Water after Coagulation and Sedimentation applied to Mechanical Filter No. 520.</i>						
540	14	2	70.0	90.7	95.8	40
<i>Effluent from Mechanical Filter No. 520.</i>						
30	1	0	98.3	99.3	100.0	3

LOADED FILTERS FOR COLOR REMOVAL.

During the year nine sand filters loaded or impregnated with ferric or aluminum hydroxide were operated. Filters of this type, originating at the Lawrence Experiment Station, have been operated continuously since 1917 and have been fully described in previous reports. All these filters are operated as slow sand filters at a rate of 5 million gallons per acre daily.

Constructional Data on Color Removal Filters.

FILTER No.	Date Started.	Ferric or Aluminum Sulphate per Acre (Tons).	Ferric Hydroxide or Aluminum Hydroxide per Acre (Tons).	Depth of Sand (Feet).	Effective Size of Sand (Millimeter).
488	May 14, 1917	64.5	34.5	4	.25
494	June 7, 1918	80.5 ¹	20.2	4	.25
496	Sept. 19, 1918	27.0	14.4	4	.25
535	Nov. 24, 1923	80.4	43.0	4	.25
536	Jan. 25, 1924	81.0	43.3	4	.25
563	July 31, 1928	134.0	71.6	4.5	.22
564	July 31, 1928	134.0	71.6	4.5	.22
565	July 31, 1928	134.0	71.6	4.5	.23
566	Aug. 18, 1928	134.0	71.6	4.5	.23

¹ Aluminum Sulphate.

Data on Operation of Color Removal Filters since Beginning of Operation.

FILTER No.	AVERAGE GRAINS USED PER GALLON OF WATER FILTERED.		Number of Times Treated with NaOH (Regenerated).	Average Number of Days between Treatments.	Average Color.
	Caustic Soda.	Ferric or Aluminum Sulphate.			
Applied water	—	—	—	—	.41
488	.43	.051	62	57	.14
494	.41	.07	59	54	.16
496	.14	.024	16	198	.08
535	.44	.20	18	63	.12
536	.30	.15	18	83	.14

Average Chemical Analyses.

[Parts in 100,000.]

FILTER No.	Color.	AMMONIA.			NITROGEN AS —		Oxygen con- sumed.	Iron.	Alka- linity.
		Free.	ALBUMINOID.		Nitrates.	Nitrites.			
			Total.	In Solution.					
Applied water	.46	.0119	.0196	.0117	.019	.0005	.49	.1170	1.5
488	.17	.0068	.0084	—	.022	.0002	.23	.0440	0.9
494	.16	.0074	.0097	—	.020	.0002	.23	.0380	0.8
496	.08	.0074	.0077	—	.021	.0004	.15	.0180	1.3
535	.16	.0111	.0086	—	.022	.0003	.18	.0290	1.2
536	.18	.0031	.0069	—	.021	.0000	.14	.0180	2.1

Average Bacterial Analyses.

FILTER No.	BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			B. Coli in 100 cc.
	4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		
		Total.	Red.		Total.	Red.	
Applied water	1,800	150	48	—	—	—	2,900
488	95	9	2	94.7	94.0	95.8	25
494	130	10	2	92.8	93.3	95.8	11
496	77	6	0	95.7	96.0	100.0	2
535	120	10	2	93.3	93.3	95.8	15
536	100	7	1	94.4	95.3	97.9	8

EFFECT OF CEMENT-LINED PIPES UPON SURFACE WATER.

Cement-lined pipes, so long as this lining remains intact, do not experience a loss of capacity due to rust and tuberculation as is the case with ordinary cast iron pipes, but on the other hand, they increase the hardness of certain waters; for example, the hardness of samples of water collected from services on comparatively new cement-lined mains at Danvers varied from 3.4 to 11.0 parts in 100,000 while samples collected from services on the iron mains had a hardness not exceeding 2.0 parts. The alkalinity of the cement-lined mains, mostly caustic alkalinity, varied from 1.5 to 7.4 parts in 100,000. It is this caustic alkalinity which is probably most noticeable and objectionable to the domestic user of such water. The kind of hardness imparted by the cement lining depends largely on the length of time that water is in contact with it and on the age of the pipe. Water flowing through cement-lined mains, even after several years' use, takes up a certain amount of carbonate hardness which may be objectionable in certain industries. Water in contact with the lining for a comparatively short time dissolves such a small amount of calcium oxide that the 0.2 to 0.4 parts free carbon dioxide in 100,000 in this water may convert the calcium oxide to carbonate. Examination of two pieces of 4-inch cement-lined pipe from the Danvers Water Department showed that the lining of the new unused pipe appeared smooth and compact while the surface lining of the pipe which had been in service eighteen months appeared porous and was of a chalky consistency which could be readily removed. This condition of the surface is due to the action of the water; that is, free calcium oxide and carbonate are dissolved, hence the remaining cement and sand mixture become soft and porous. After this surface lime is dissolved, the chemical action becomes much slower because of this protective coating of sand and cement mixture. Examination of the two pieces of pipe mentioned showed that 4.4 per cent of the calcium oxide and .07 per cent of the magnesium oxide in the surface lining had been dissolved from the used pipe.

REPORT OF DIVISION OF FOOD AND DRUGS.

HERMANN C. LYTHGOE, *Director.*

The Food and Drug Division of the Massachusetts Department of Public Health has been engaged during the year 1928 in the usual routine work of the enforcement of the milk, pasteurization, food, drug, cold storage, slaughtering, bakery, soft drink, shellfish, and mattress laws, and in the examination of samples of liquor and narcotics submitted by Police Departments. The inspectors collected, and the chemists examined, 8,831 samples of milk; 1,216 samples of food other than milk; 87 samples of drugs; and 99 samples of shellfish were examined for the presence of sewage. In addition, the chemists examined 8,667 samples of liquor and 81 samples of narcotics, etc., submitted by Police Departments; and 7 samples of coal, submitted by the Commission on the Necessaries of Life, the Division of Standards, and the Sealer of Weights and Measures of the City of Boston.

There were 327 prosecutions, of which 304 were convicted and the balance of the cases were disposed of as shown in the following table.

Summary of Prosecutions.

	Convicted.	Discharged.	Nolo Contendere on File.	Dismissed.
Milk:				
Low standard	107	3	-	-
Cream removed	6	2	-	-
Watered	33	5	-	-
Cream, low standard	1	-	-	-
Cider, misbranded	1	-	-	-
Clams:				
Sewage polluted	4	1	-	1
Watered	9	2	-	-
Sulphites in food:				
Dried fruits	5	-	-	-
Hamburg	4	-	-	-
Sausages	3	-	-	-
Sausages:				
Colored	1	-	-	-
Excess cereal	1	-	-	-
Maple Products	2	-	-	-
Olive Oil	2	-	-	-
Scallops, watered	1	-	-	-
Oleomargarine	-	1	-	-
False Advertising:				
Cream	-	1	-	-
Maple Sugar	1	-	-	-
Maple Syrup	33	1	-	-
Fresh Eggs	21	-	1	-
Decomposed Eggs	2	-	-	-
Cold Storage Eggs	38	-	1	-
Representing cold storage food as fresh	1	-	-	1
Drugs	3	-	-	-
Violation of Slaughtering Laws	10	-	-	-
Violation of Pasteurization Laws	10	-	-	-
Violation of Mattress Laws	5	3	-	-
Totals	304	19	2	2
Grand total	327			

The inspectors confiscated 1,896½ pounds of meat, 1,155 pounds of poultry, 386 pounds of fish and 60 gallons of oysters. These confiscations were made in the cold storage warehouses, in wholesale markets, and in retail markets.

A summary of these confiscations is as follows:

Confiscations in Warehouses.

Poultry		8 confiscations
Broilers	30 lbs.	
Chickens	207 lbs.	
Ducks	116 lbs.	
Fowls	247 lbs.	
Roosters	160 lbs.	
Turkeys	196 lbs.	956 lbs. Total

Meat		10 confiscations
Beef kidneys	275 lbs.	
Calves' livers	25 lbs.	
Lamb and Pork	40 lbs.	
Pork (brains)	60 lbs.	
Pork (hocks)	184 lbs.	
Pork (livers)	60 lbs.	
Pork (tenderloins)	110 lbs.	
Sausage	199 lbs.	
Veal	23 lbs.	976 lbs. Total

Confiscations in Stores and Factories.

Meat		11 confiscations
Beef	730 lbs.	
Frankforts	25 lbs.	
Pork (lights)	1 lb.	
Pork (livers)	19½ lbs.	
Veal	20 lbs.	
Miscellaneous meats	125 lbs.	920½ lbs. Total
Poultry		6 confiscations
Chickens	63 lbs.	
Geese	50 lbs.	
Turkeys	86 lbs.	199 lbs. Total
Fish		6 confiscations
Ground fish	5 lbs.	
Lobster	16 lbs.	
Mackerel	25 lbs.	
Oysters	60 gal.	
Scallops	340 lbs.	{ 386 lbs. } Total 60 gals.

It will be seen from the report of the summary of prosecutions that a large number of cases was brought for the sale of milk not of good standard quality. The bulk of these cases was brought against restaurant keepers who persisted in selling skimmed milk to their customers in place of a glass of milk ordered by the customer. The Department has, through the press, on many occasions advised restaurant keepers that the sale of milk from dispensing tanks having a faucet in the bottom is liable to result in the sale of skimmed milk to most of the customers, and restaurant keepers have been personally advised to serve milk in 10-ounce bottles furnished by the milk dealer. Practically all these low standard samples were in fact adulterated but cases were brought under the low standard law because the adulteration law carries a minimum fine of fifty dollars (\$50.00), whereas the low standard law carries no minimum fine. Eight cases, however, were brought for selling milk from which a portion of the cream was removed, most of these cases being brought against either milk dealers or producers. Practically all of the thirty-eight cases brought for the sale of milk containing added water were brought against milk producers. A few were brought against milk dealers who were purchasing milk free from water and selling milk which contained water.

The following is a summary of the milk statistics.

Summary of Milk Statistics.

Number above the standard	6,823
Number below the standard	2,008
Total	8,831
Number of samples having cream removed	227 ¹
Number of samples of watered milk	212
Number of samples containing foreign substance	1
Number of samples having cream removed and watered	1
Number of samples of skimmed milk below standard	1
Number of samples of skimmed milk above standard (skimmed marked)	1

¹ Four of these samples were also watered.

A summary of the average quality of milk, by months, will be found in Tables 2 and 3.

The work upon pasteurizing plants was seriously handicapped by the septic sore throat epidemic in Lee because the inspector who spends his full time on pasteurizing plants was transferred to work in Lee, and another inspector was sent to Lee to assist in the work. Dr. Stirrett, one of the veterinary inspectors so assigned, was fortunate enough on the day after his arrival in Lee to isolate the cow that was responsible for the epidemic. It was deemed advisable to examine cows upon the largest dairy supplying the milk dealers with milk, and it happened that upon this dairy was the cow responsible for the epidemic. During the course of this work, samples of milk were taken from all the cows supplying the town of Lee with milk, and these samples were examined bacteriologically. After the epidemic was over, an additional examination was made of the milk of the cows on the premises where persons resided who had acquired the disease, and not until the second examination showed that the milk was safe as far as possible infection where Haemolytic Streptococci was concerned did the Department declare that the Board of Health could revoke its requirement that the milk must be either pasteurized or boiled. Incidentally, it was learned subsequent to the taking of these samples that the Board of Health of Lee revoked this requirement upon the day that the samples were taken and prior to receiving a report of the bacteriological examination.

The difficulty of doing this work was very great because of the fact that the bulk of the dairies supplying Lee with milk was of the one or two cow variety, the dairies having five or more cows being few in number. The casual inspection made of these dairies while collecting these samples indicated that there was practically no attempt on the part of the Board of Health of Lee to enforce any regulation relative to the sanitation of the dairies.

The Department secured funds from the Legislature to carry on a system of local inspection in Berkshire County. The first work under this appropriation was the drawing up of a set of regulations to recommend to the Boards of Health for adoption. There was first a public hearing upon the proposed regulations, followed by a meeting of a committee consisting of representatives of the Boards of Health and of the farmers. At a meeting of the committee it was noticeable that the farming element was more desirous of rigid regulations than were the representatives of the Boards of Health. After these regulations were adopted by this Department, inspectors were sent to Berkshire County to inspect the dairies with a representative of the Board of Health of the town where the milk was to be sold. In one instance the milk inspector declined to go with our inspector. After the inspections were made, the results were tabulated and were sent to each Board of Health, calling attention to specific violations of the regulations suggested by this Department, and the Boards of Health were requested to see that the clean-up work was done. In some instances the Board of Health complied. One member of one Board of Health thought that it was a very unjust process for this Department to inform the Board what was wrong and then require the Board to do the dirty work in cleaning up the dairies.

While this work was going on, an intensive study was made as to the composition of the milk in relation to solids, fat, and adulteration. A number of cases were prosecuted, and some cases are pending at the end of the fiscal year. Arrangements were then made to begin bacteriological examinations of samples of milk furnished by farmers for pasteurization and of raw milk and pasteurized milk sold as such.

As a result of our activities in Berkshire County, there have been established four new pasteurizing plants, two of which can be used as models, and the other two are small plants located on farms producing their own milk. Both of these plants are in good condition. The other pasteurizing plants in Berkshire County have been in operation for some time, and with but two exceptions are being operated in accordance with the regulations. It was found necessary to prosecute the proprietors of two of these plants, both cases resulting in conviction. The prosecutions resulted in a slight improvement in the plants in question, but it was found necessary at the close of the fiscal year to inform the proprietors of each

of these plants that unless conditions materially improved, the Department would be obliged to take drastic action.

Violations of the pasteurizing law, which resulted in prosecution, occurred in Agawam, Middleton, West Springfield, Wilbraham, and Williamsburg, all cases resulting in conviction with the imposition of substantial fines. In all these cases the defendants had been given ample opportunity to put their plants in shape prior to prosecution.

The improvement in the operation of pasteurizing plants has been marked since the passage of the law. Very few of the proprietors of these plants had to be urged to put their plants in shape. We have actually accomplished in the first two years of work under this law what we had anticipated would require about five years to do, and the credit for this should not go to this Department nor to the Boards of Health of the towns, but should go to the operators of the milk pasteurizing plants. There are very nearly five hundred pasteurizing plants in the state, and there are quite a number of plants, we believe, which we have not yet located. It frequently happens that the inspectors of this Department locate a pasteurizing plant before the Board of Health of the town is officially aware of its existence.

In making the first inspections of the plants, the inspectors ascertain the amount of milk to be pasteurized per day. The applications for license, copies of which are filed with this Department, also state the estimated amount of milk to be pasteurized daily. We have tabulated this data for 460 such plants. Five per cent of the plants pasteurize 200 quarts or less per day; fifteen per cent pasteurize 350 quarts or less per day; twenty-nine per cent pasteurize 500 quarts or less per day; and fifty-four per cent pasteurize 800 quarts or less per day. The average plant pasteurizes about 760 quarts per day. One plant pasteurizes as high as 80,000 quarts per day; four plants pasteurize as high as 50,000 quarts per day; two plants pasteurize as high as 40,000 quarts per day; and five plants pasteurize as high as 30,000 quarts per day.

The total amount of milk pasteurized per day is 1,296,490 quarts. The daily consumption of milk in Massachusetts has been estimated at 2,000,000 quarts, and therefore we can estimate that approximately 65 per cent of the milk sold in Massachusetts is pasteurized.

The next step in the inspection of the pasteurizing plants is to go into further detail as to the efficiency of the process, such as the collection of samples before, during, and after pasteurization, as well as bottling, in order to see whether or not the reduction in bacteria is what should be expected. It may be assumed that if the milk has been held for thirty minutes at a temperature of 140° F., the bacterial content has been materially reduced. If, however, this milk is then pumped through a dirty pump over a dirty cooler and through a dirty bottle filler, into dirty bottles, the bacterial count will be increased by each subsequent operation. This will mean considerable increase in the laboratory work and considerable decrease in the number of plants inspected by the inspector. A study of this sort two or three times a year upon each pasteurizing plant is highly desirable.

Foods Other Than Milk.

The following table gives a summary of statistics of food samples other than milk, collected by the inspectors and examined by the chemists. Only such foods as were determined to be adulterated will be discussed here.

Included in the butter figures are the results of the analyses of samples submitted by the Department of Agriculture, many of which samples were oleomargarine. There were also a large number of samples examined to see if they conformed with the fat standard of 80 per cent. No violations were found.

A large number of samples of clams and scallops were obtained and examined for the presence of added water. Many of the samples of clams were also examined to see whether or not they were polluted. There were 48 samples of clams in the shell examined, of which 11 were found to be polluted; and there were 51 samples of shucked clams examined, of which 13 were found to be polluted, making a total of 99 samples examined, 24 of which were polluted. This is a slight improvement over the shellfish examined in 1927, when about 48 per cent were found to be polluted.

Summary of Food Statistics.

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Bakers' Supplies	2	—	2
Butter	61	14	75
Canned Fruits	1	—	1
Cheese	7	—	7
Chocolate	14	—	14
Cider	1	—	1
Clams	94	79	173
Confectionery	1	—	1
Cream	48	6	54
Dried Fruits	4	9	13
Dulse	—	1	1
Eggs	208	159	367
Flavoring Extracts	10	—	10
Flour	1	—	1
Honey	1	—	1
Ice Cream	23	—	23
Maple Sugar	4	2	6
Maple Syrup	19	38	57
Meat Products:			
Chicken	1	—	1
Hamburg	21	14	35
Sausage	297	14	311
Miscellaneous:			
Caustics and Corrosives	2	1	3
Tin	—	2	2
Olive Oil	11	11	22
Peanut Butter	1	—	1
Scallops	10	6	16
Soft Drinks	12	—	12
Vinegar	6	—	6
	860	356	1,216

The Department undertook to make some prosecutions for the sale of sewage polluted clams, and six such cases were tried. One case was discharged; one case was dismissed because of variance; and four cases were convicted. One of the cases was tried in the Superior Court before a jury, resulting in conviction both for the sale of polluted clams and the sale of clams containing added water. The judge in his charge to the jury stated that it was unnecessary for the jury to consider the amount of sewage in the clams; if they could find from the evidence that there was any sewage in the clams, they were to find the defendant guilty. Another of the appealed cases is probably going to the Supreme Court. Of the 11 cases brought for the sale of clams containing added water, nine resulted in conviction.

The case of sewage polluted clams discharged brought up a very interesting law point. The man was accused of delivering to the inspector certain clams consisting in part of a filthy animal or vegetable substance, to wit: sewage. The judge in the Superior Court stated that a delivery to the inspector could not be construed as a delivery within the meaning of the law because the inspector had the authority to seize the clams. This decision was rendered notwithstanding the fact that the inspector stated that these clams came from the same container from which other clams were taken; put into packages; and shipped from the establishment at the time of the inspector's visit. A recommendation has been made for a change in the penalty of the food and drug law because of this decision.

The retail fish dealer apparently has no sympathy with the efforts of the Department to clean up the shellfish situation. When called in for a hearing, his story is usually, "I bought the clams from Mr. So and So. What are you going to do about it?" In striking contrast to one of these hearings was the appearance of a storekeeper immediately at the close of the clam hearing. He showed a postal card, showing that the Department had obtained a sample of milk slightly below the standard. The storekeeper wanted to know what he could do to secure a milk conforming in every respect with the standard.

There have been a few cases tried in the courts, where the retail dealer has been afflicted with a complete loss of memory as to the person from whom the shellfish in question were obtained, and in one instance, only a hearing notice sent to the proprietor of the store was able to induce the witness to recollect whose clams the inspector had samples of. The storekeeper was informed that unless he could show where the clams came from, the burden was upon him to show that the clams complied in every respect with the law.

The usual examination of eggs was carried on in the early part of the year and in the latter part of the year. The inspectors collected in all 367 samples, of

which 159 were declared to be in violation of the law. The principal violation consisted in selling cold storage eggs without causing the package to be labeled; in falsely advertising antique but edible eggs as "Fresh Eggs"; and in misbranding packages in which eggs were sold. Practically all the cases resulted in conviction. In one instance a fine of two hundred dollars (\$200.00) was imposed.

There is a great temptation to violate the cold storage egg law because of the prejudice of the public. The public is perfectly willing to purchase and eat cold storage eggs provided they are sold as "Fresh Eggs." There is also an added profit to the storekeeper, who can successfully get a fairly high price for a cold storage article. The violations of the cold storage egg law occur to the greatest extent during the months of September, October, November, and December, after which the violations are materially reduced because of the inferior quality of the storage eggs on hand at that period. It is a rule to remove the best eggs from storage prior to the first of December.

There were 347 samples of meat products examined, of which 35 were hamburg steak and 311 were sausages. There were 14 samples of hamburg steak and 14 samples of sausage found to be adulterated. The hamburg steak samples contained sodium sulphite and were not labeled as provided by the law. The sausage samples contained starch in excess of 2 per cent, or coloring matter, or contained sulphite preservative without having the package properly labeled. The percentage of adulteration in sausages has been materially decreased during the past two or three years.

There were collected 22 samples of olive oil, of which 11 were found to be adulterated. The enforcement of these regulations is becoming increasingly difficult. The adulterated oil is sold only to the so-called foreign trade, principally Italians and Greeks. The retail storekeeper frequently declines or is unable to furnish the Department with the name of the person from whom the olive oil was purchased. If the oil was purchased from a Massachusetts wholesaler, he is unable to state where he bought it. The Federal authorities are having difficulty because of the interstate shipment of this material by the use of privately owned motor trucks and not by common carrier. We have succeeded, however, in obtaining convictions in two instances of persons living in Providence, Rhode Island, and selling this adulterated olive oil in Attleboro and Fall River. We have cases pending of the sale of such material in Newton, Worcester, and Springfield, which cases will be set as soon as it is possible to get hold of the salesman who delivered the article.

There were examined 63 samples of maple products, of which 57 were maple syrup. Thirty-eight samples of the maple syrup were found to be adulterated. Nearly all of these were served in restaurants under the guise of "Griddle Cakes and Maple Syrup." In most cases convictions resulted.

Drugs.

The inspectors collected, and there were examined, 87 samples of drugs, of which 18 were found to be adulterated. These consisted of one sample of camphorated oil deficient in camphor; one sample of cresol submitted by a hospital, said to be U. S. P. cresol, which was found to be commercial cresol; fourteen samples of spirit of nitrous ether considerably deficient in the active ingredient; and two samples of spirit of peppermint slightly deficient in peppermint.

It was found necessary to make three prosecutions during the year for the sale of adulterated drugs.

The following is a summary of the drug statistics.

Summary of Drug Statistics.

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Camphorated Oil	22	1	23
Citrate of Magnesia	7	—	7
Cresol	—	1	1
Lime Water	1	—	1
Milk of Magnesia	1	—	1
Prescriptions	1	—	1
Spirit of Nitrous Ether	34	14	48
Spirit of Peppermint	2	2	4
Miscellaneous	1	—	1
	69	18	87

The Police Departments submitted 8,667 samples of liquor for examination, which were classified as follows:

Beer	2,064
Cider	53
Wine	681
Distilled Spirits	4,400
Flavoring Extracts	2
Alcohol	930
Miscellaneous	537

These samples were submitted by the authorities of 150 cities and towns.

In Table 4 is given a list of cities and towns submitting 25 or more samples each.

There has been considerable liquor submitted containing small quantities of methyl alcohol. This is undoubtedly due to the sale of liquor, the alcohol of which has been recovered from one or more of the many varieties of denatured alcohol containing methyl alcohol. These samples came from Boston, Braintree, Chicopee, Greenfield, Lawrence, Lynn, Northampton, Salem, Salisbury, and Scituate, and amounted to 33 samples. In addition, there were samples of denatured alcohol submitted containing methyl alcohol and pyridine; diethylthallate; methyl alcohol, acetone and pyridine; and formaldehyde; representing 32 samples. Several samples submitted were mixed with dead oil, a common disinfectant sold under different proprietary names. One sample contained considerable ethyl acetate; another was a mixture of alcohol with amyl alcohol and esters. One sample of Sterno Canned Heat was also submitted. The amount of methyl alcohol in samples of liquor which could not be considered as denatured varied somewhat but generally was less than 6 per cent of the total alcohol. The methyl alcohol varied in actual quantity from .82 per cent up to 4.33 per cent. One sample, however, which deserves special mention, contained 26.95 per cent of ethyl alcohol and 4.65 per cent of methyl alcohol. This quantity of methyl alcohol was sufficiently high to be considered dangerous. The other samples containing 4 per cent of methyl alcohol contained about 80 per cent of ethyl alcohol, and when diluted to the concentration usually employed in drinking, the methyl alcohol concentration would not be sufficiently high to be considered very dangerous, the great danger in these instances being from the total alcohol consumed. In all cases where methyl alcohol was found, and the material was not a denatured alcohol described by the regulations of the United States Treasury Department, a letter was sent to the Police Department, advising an additional complaint to be made under the law providing a heavy penalty for selling foods containing methyl alcohol. In many instances such cases were set and the defendants were severely punished. The average alcoholic content of all this liquor was approximately 30 per cent. Thirty-two per cent of the samples contained less than 10 per cent of alcohol; 42 per cent contained less than 25 per cent of alcohol; and only 12 per cent contained more than 50 per cent of alcohol.

The Police Departments also sent 81 samples of drugs, chemicals, and poisons for examination. Forty of these samples were morphine, and 12 of them were opium; 15 were examined for narcotics or alleged poisons, with negative results.

A summary of these figures is in the following table.

Summary of Examinations of Drugs, Chemicals, and Poisons for Police Departments.

Ammonium sulphide	1
Ethyl benzoate	1
Ergot	3
Heroin	1
Morphine	40
Opium	12
Phosphorus	2
Quinine	1
Strychnine	1
Tincture of iodine	2
Zinc chloride	2
Examined for narcotics or alleged poisons with negative results	15

The Legislature of 1928 amended the law regarding shellfish, and under this law the Department issued certificates for use in interstate commerce to persons who complied with the regulations. A fee of two dollars (\$2.00) was required for a person who shipped his own shellfish outside of the state, and a fee of ten dollars (\$10.00) was required from a person maintaining an establishment or buying from other dealers.

In carrying out this work sanitary inspections were made of the establishments and the boats, and the fishermen were instructed as to methods of keeping their books in order to comply with the requirements of the U. S. Public Health Service. These certificates have been requested only by persons who are shipping shellfish to New York City, and in a few instances by persons who were shipping to the State of Rhode Island. Apparently the fishermen experience no difficulty in shipping elsewhere in the United States without such certificates. These certificates have been issued mainly to fishermen in Bristol, Barnstable, Dukes, and Nantucket Counties, with a very few issued to people living in Essex County. From the information gathered by our inspectors, there is considerable interstate shipment of shellfish between Massachusetts and New York without these certificates. Persons in Massachusetts sending supplies direct to New York hotels have apparently been able to make their shipments without any interference from the New York City health authorities.

In the work under the slaughtering inspection law, the Division has investigated the qualifications of a number of new nominees for the position of inspector of slaughtering. In many instances these new nominations are made for the purpose of paying political debts, and after the Department has ascertained that the man is incompetent for the position, the Board of Health of the town will then send in the name of the prior incumbent, and if the Departmental records show that his work has been carried out in a satisfactory manner, the nominee is approved. It is becoming increasingly difficult in the towns to replace an inspector who has died because of the absence of qualified men for these positions. The local slaughterhouses are slowly shutting down, and consequently there is less opportunity for persons to obtain experience in post-mortem examination of the carcasses intended for food purposes.

The inspectors of this Department have ascertained in a number of instances that local inspectors of slaughtering have been applying the stamp to diseased carcasses. In all of these instances the inspector has been removed by this Department. As examples of this may be cited instances of the stamping of carcasses of beef afflicted with generalized tuberculosis. One of the violators was a registered veterinary surgeon. Other instances involved the stamping of carcasses of hogs afflicted with hog cholera.

It was found necessary to make ten prosecutions for violating the slaughtering laws, all of which resulted in conviction. These prosecutions were for slaughtering without a license; slaughtering in the absence of the inspector; violating the regulations of the Department; and having in his possession unstamped meat with intent to sell the same.

In carrying out the provisions of the slaughtering laws, the Department has one full time veterinary inspector, and another veterinary inspector, who is used part time upon the work.

The slaughtering inspectors reported to the Department that there were 180,487 carcasses, of which 2,597 were condemned as unfit for food. The most prevalent reasons for confiscation were immaturity in the case of calves and occasionally in hogs and sheep; tuberculosis in cattle, calves, hogs, and sheep; cholera in the case of hogs; which accounts for nearly 86 per cent of the total confiscations. A summary of these figures is shown in Table 5.

The licensed cold storage warehouses have been inspected for sanitary conditions, and the character of the food in storage is looked over frequently by the inspector who spends his full time upon this work. There were 82 requests made for extension of time in storage, which requests were granted. There were 16 such requests refused; and 70 lots of goods were ordered from storage at the expiration of the twelve months storage provided by statute.

A detailed summary of these requests for extension is shown in Tables 6, 7, 8, and 9.

A summary of the monthly reports of the cold storage warehouses is given in Tables 10, 11, 12, and 13.

The Department investigated 326 bakeries located in 24 cities and towns, 36 visits being made to these localities. In cases where violations occurred, the Board of Health of the town was informed of the violation and was directed to see that the bakeries were made to conform with the provisions of the law.

The Boards of Health of 13 cities and towns reported that they had inspected 3,833 bakeries during the year, which is just slightly under 300 inspections per locality. The towns reported that they had given 491 verbal warnings; 554 written warnings; 9 hearings; and in one instance a medical examination was ordered.

The city of Boston reported 2,110 inspections.

The city of Springfield reported 800 inspections.

The city of Lynn reported 277 inspections.

The city of Lawrence reported 210 inspections.

The city of Fall River reported 183 inspections.

The city of North Adams reported 99 inspections.

The town of Framingham reported 44 inspections.

The town of Arlington reported 38 inspections.

The city of Melrose reported 29 inspections.

The city of Newton reported 19 inspections.

The town of Middleborough reported 11 inspections.

The town of Greenfield reported 9 inspections.

The town of Dedham reported 4 inspections.

The Department is required to enforce the state mattress law, and is not properly equipped with personnel sufficient to do a satisfactory job. The Legislature of 1928 considered a change in the law and reported a change, but not to the extent requested. The bill introduced by the mattress trade included a licensing system; the sale of tags by the Commonwealth; and the appointment of a sufficient number of inspectors to supervise the factories making mattresses and upholstered furniture. There was also a bill introduced for an investigation of the mattress business. The committee reported a change in the mattress law to include also upholstered furniture, and the committee reported a bill for the Department of Public Health to investigate both industries.

At the hearing before the Senate Ways and Means it was stated that five thousand dollars (\$5,000.00) would be necessary to adequately investigate both industries. The Senate Ways and Means consequently reported appropriation of twenty-five hundred dollars (\$2,500.00) for this work. After this was considered by the House Ways and Means, it was apparently deemed advisable to make no investigation. One of the persons representing the trade stated that it was the intention of the sponsors of this bill to have the mattress manufacturers themselves make the investigation at no expense to the Commonwealth.

The Department has seen fit to prosecute eight cases for violation of the mattress law, of which three were discharged. These discharged cases covered the question of the use of second hand material in mattresses. One of these cases was tried under the old law, and the expert witness employed by the Commonwealth was apparently unable to satisfy the court as to his ability to tell the difference between new material and second hand material. The other cases involved two offences by the same company, and the expert witness employed by the Department declined to testify that the material was second hand. These particular cases were tried under the provisions of the new law, which defined "second hand" as "Material which had been used as a part or portion of another manufactured article." Shortly after the passage of this law an inspector visited all the mattress manufacturers in the state and informed the proprietor of the new law and also informed him of the new meaning of the term "second hand."

There are a number of people in the business of preparing material for sale to mattress manufacturers. They claim that the use of remnants from tailor shops of cloth which has not been worn by any person should not be called "second hand." It is also a well known fact that after this material has been put through machinery and made into felt, it is impossible to distinguish between material

made from cloth which has not been worn and material made from discarded trousers. At the close of the fiscal year, the inspectors began to collect evidence of violation of this law in Middlesex County, and it is proposed to take the matter to the District Attorney in the early part of the coming year and have the matter passed upon by a jury in the Superior Court.

TABLE 1. — *For Sale of Milk not of Good Standard Quality.*

NAME.	Address.	Court.	Date.	Result.
Anagnoston, Theodore	Chelsea	Chelsea	Mar. 19, 1928	Conviction ¹
Angelis, Charles	Chelsea	Chelsea	Sept. 26, 1928	Conviction
Arrighi, Ugo	Adams	Adams	June 15, 1928	Conviction
Athanasios, Charles	Middleborough	Middleborough	May 8, 1928	Conviction
Bach, Louis A.	Holyoke	Holyoke	Jan. 5, 1928	Conviction
Barkas, Theodore G.	Gloucester	Gloucester	Oct. 24, 1928	Conviction
Bassett, Frank	Greenfield	Greenfield	Aug. 14, 1928	Conviction
Bassett, Frank	Greenfield	Greenfield	Aug. 14, 1928	Conviction
Blackburn, Hunter	Lynn	Lynn	Nov. 9, 1928	Conviction
Blanchard, Louis	Duxbury	Plymouth	Nov. 6, 1928	Conviction
Boraschi, Fred	Revere	Chelsea	Nov. 26, 1928	Conviction
Busy Bee Confectionery Company	Chelsea	Chelsea	Oct. 10, 1928	Conviction
Cantoni, Ina	Plymouth	Plymouth	Sept. 27, 1928	Conviction
Carter, John A.	North Weymouth	Plymouth	Oct. 16, 1928	Conviction
Conairis, Charles	Milford	Milford	Apr. 20, 1928	Conviction
Contsibos, Chris	Franklin	Walpole	June 11, 1928	Conviction
Costello, J. J.	Franklin	Franklin	June 26, 1928	Conviction
Cournoyer, Helaier	Southbridge	Southbridge	July 16, 1928	Conviction
Dakin Company, E. F.	Southbridge	Southbridge	Sept. 7, 1928	Conviction
Day & Night Lunch, Incorporated	Springfield	Springfield	May 17, 1928	Conviction
Delande, Reni	Salem	Salem	Aug. 20, 1928	Conviction
De Vito, Joseph	Stoughton	Stoughton	Aug. 6, 1928	Conviction
Di Girgori, Josephine	Revere	Chelsea	Sept. 12, 1928	Conviction
Dimetropoulos, Sterios	Salem	Salem	Sept. 28, 1928	Conviction
Eaton, Nicholas T.	Newburyport	Newburyport	Sept. 26, 1928	Conviction
Equi, Caesar	Holyoke	Holyoke	Feb. 9, 1928	Conviction
Ernst, Charles	Cambridge	Cambridge	Sept. 21, 1928	Conviction
Fern, Eric	Newburyport	Newburyport	Sept. 26, 1928	Conviction
Fiske, Howard H.	Cambridge	Cambridge	Sept. 10, 1928	Conviction
Fiske, Howard H.	Cambridge	Cambridge	Sept. 10, 1928	Conviction
Flockes, Lewis M.	Salem	Salem	Aug. 20, 1928	Conviction
Fornarci, Augustine	Framingham	Framingham	July 10, 1928	Conviction
Frangoulis, Frank	Natick	Natick	May 7, 1928	Conviction
Frank, John	Salisbury	Amesbury	Sept. 19, 1928	Conviction
Gerardi, Anthony	New Bedford	New Bedford	Mar. 30, 1928	Conviction ¹
Giarmsi, Louis F.	Holyoke	Holyoke	Feb. 9, 1928	Conviction
Giftos, Peter	Pittsfield	Pittsfield	Feb. 17, 1928	Conviction
Gold, Phillip	Salem	Salem	Sept. 27, 1928	Conviction
Gorgos, Charles	Springfield	Springfield	Apr. 17, 1928	Conviction
Goulos, George	Salem	Salem	Sept. 28, 1928	Conviction
Gouzoules, Harry P.	Lynn	Lynn	Nov. 9, 1928	Conviction
Hanley, Lawrence F.	Cambridge	Cambridge	July 6, 1928	Conviction
Harrington, Jerome C.	Belmont	Cambridge	Apr. 10, 1928	Conviction
Hashem, Elly G.	Revere	Chelsea	Sept. 12, 1928	Conviction
Huntley, Nelson H.	Wilmington	Woburn	Nov. 16, 1928	Conviction
Janopoulos, Louis	Dedham	Dedham	Apr. 8, 1928	Conviction
Joyce, John J.	Lynn	Lynn	Nov. 9, 1928	Conviction
Kectic, Mike	Chelsea	Chelsea	Mar. 19, 1928	Conviction
Klink, John J.	Revere	Chelsea	Sept. 12, 1928	Conviction
Kollen, Edward	Cambridge	Cambridge	Apr. 3, 1928	Discharged
Kontrafuris, George	New Bedford	New Bedford	Mar. 20, 1928	Conviction
Lagadinis, Nicholas	Worcester	Worcester	Oct. 2, 1928	Conviction ¹
Lavoulairs, George	Fairhaven	New Bedford	Feb. 7, 1928	Conviction
Liopes, Peter	Lynn	Lynn	Dec. 7, 1927	Conviction
Liopes, Peter	Lynn	Lynn	Nov. 9, 1928	Conviction
Lucchesi, William	Holyoke	Holyoke	Jan. 5, 1928	Conviction
Luchini, Adolfo	Holyoke	Holyoke	Jan. 5, 1928	Conviction
McAvoy, George	Cambridge	Cambridge	Apr. 3, 1928	Conviction
McGlone, William	Walpole	Walpole	May 28, 1928	Conviction
McLean, John	Wilmington	Woburn	Oct. 11, 1928	Conviction
McManus, Joseph	Wrentham	Walpole	May 28, 1928	Conviction
Mesakian, Hagop	Watertown	Waltham	Aug. 30, 1928	Conviction
Metro, Vassel	Southbridge	Southbridge	Sept. 7, 1928	Conviction
Milona, Nicholas	Chelsea	Chelsea	Sept. 12, 1928	Conviction
Mirisola, Frank	Wilmington	Woburn	Oct. 11, 1928	Conviction
Morse, Edward W.	Rockport	Gloucester	Mar. 7, 1928	Conviction
Neri, Antonio	Revere	Chelsea	Feb. 27, 1928	Discharged
Noble, Andrew	Marblehead	Marblehead	Mar. 27, 1928	Conviction
Ormandrioli, Oliver	Concord Junction	Concord	May 21, 1928	Conviction
Paine, Lena	Marshfield	Plymouth	Oct. 16, 1928	Conviction
Pappas, Antonio	Watertown	Waltham	May 22, 1928	Conviction
Pappas, John	Dedham	Dedham	June 4, 1928	Conviction
Pashoogian, Arakel	Lynn	Lynn	Nov. 9, 1928	Conviction

¹ Appealed.

For Sale of Milk not of Good Standard Quality — Concluded.

NAME.	Address.	Court.	Date.	Result.
Pelletier, Charles	Salem	Salem	Aug. 20, 1928	Conviction
Peterson, Estate of Walter	Marshfield	Plymouth	Oct. 16, 1928	Conviction
Plakias, George A.	Medford	Malden	June 26, 1928	Conviction
Porter, Harry	Wilmington	Woburn	Oct. 11, 1928	Conviction
Porter, Lewis	Salem	Salem	Sept. 27, 1928	Conviction
Pow, Andrew	Northampton	Northampton	Jan. 13, 1928	Conviction
Prentice, Paul E.	Greenfield	Greenfield	Aug. 14, 1928	Conviction
Prentice, Paul E.	Greenfield	Greenfield	Aug. 14, 1928	Conviction
Proulx, Isaac	Walpole	Walpole	June 11, 1928	Conviction
Ratsy, Peter	Taunton	Taunton	Apr. 13, 1928	Conviction
Rechichi, Ferdinando	Watertown	Waltham	April 16, 1928	Conviction
Richards, Ferdinand	Hull	Hingham	Aug. 31, 1928	Conviction
Richards, Ferdinand	Hull	Hingham	Aug. 31, 1928	Conviction
Richardson, William	Salem	Salem	Sept. 27, 1928	Conviction
Sardinsky, Peter	Peabody	Peabody	Feb. 3, 1928	Conviction
Sheehan, John L.	Salem	Salem	Sept. 28, 1928	Conviction
Sherman, Ada	Marshfield	Plymouth	Oct. 16, 1928	Conviction
Siganos, Jack	Newburyport	Newburyport	Sept. 26, 1928	Discharged
Silvia, Manuel	Provincetown	Provincetown	Sept. 20, 1928	Conviction
Stairopoulos, Peter	Springfield	Springfield	Aug. 11, 1928	Conviction ¹
Stathopoulos, Arthur	Beverly	Salem	Oct. 26, 1928	Conviction
Sullivan, Richard J.	South Deerfield	Greenfield	Feb. 24, 1928	Conviction
Sweeney, John C.	Milford	Milford	Apr. 20, 1928	Conviction
Theodopolous, Arthur	Cambridge	Cambridge	Mar. 20, 1928	Conviction
Tritor, John	Middleborough	Middleborough	Apr. 24, 1928	Conviction
Varrouletos, George	Hull	Hingham	Aug. 31, 1928	Conviction
Vasilajis, Ethmos	Cambridge	Cambridge	Jan. 9, 1928	Conviction
Vasilakos, George	Salem	Salem	Sept. 27, 1928	Conviction
Velinusi, Sotirio	Nantucket	Nantucket	Aug. 16, 1928	Conviction
Vratos, Peter	Walpole	Walpole	May 28, 1928	Conviction
Vucassovich, Joseph M.	Hull	Hingham	Aug. 31, 1928	Conviction
Walsh, Edward F.	Arlington	Cambridge	Nov. 23, 1928	Conviction
Webster, Egbert	Plymouth	Plymouth	Sept. 27, 1928	Conviction
Witherell, Monson L.	Gloucester	Gloucester	Nov. 8, 1928	Conviction
Wollan, John	Stoughton	Stoughton	Jan. 17, 1928	Conviction
Woo, Seid F.	Pittsfield	Pittsfield	Dec. 15, 1927	Conviction
Zahos, John	Malden	Salem	Oct. 29, 1928	Conviction

For Sale of Milk from which a Portion of the Cream had been removed.

Bellerose, Edmund	Southbridge	Southbridge	June 8, 1928	Conviction
Bellerose, Edmund	Southbridge	Southbridge	June 8, 1928	Conviction
Capen, Frank H.	Marshfield	Plymouth	Oct. 16, 1928	Conviction ¹
Dyer, Walter	Natick	Framingham	Nov. 15, 1928	Conviction
Pietrasink, Victor	Easthampton	Northampton	Nov. 27, 1928	Conviction
Snider, Nathan	Framingham	Framingham	Nov. 15, 1928	Conviction
Snider, Nathan	Framingham	Framingham	Nov. 15, 1928	Discharged
Wuth, George	Clinton	Clinton	July 13, 1928	Discharged

For Sale of Milk containing Added Water.

Brown, Winthrop M.	Lunenburg	Fitchburg	Feb. 14, 1928	Conviction
Charney, Morris	Chelsea	Chelsea	Apr. 2, 1928	Conviction
Cummings, Everett E.	Woburn	Woburn	Mar. 6, 1928	Conviction
Dastugue, Simon	Sudbury	Framingham	July 6, 1928	Conviction
Deline, Ernest L.	Sutton, Vt.	Montpelier, Vt.	Nov. 19, 1928	Conviction
Dyer, Walter	Natick	Framingham	Nov. 15, 1928	Conviction
Fiske, James A.	Cliftondale	Saugus	Nov. 10, 1928	Conviction ¹
Floyd Milk Company, Incorporated	Winthrop	East Boston	Dec. 1, 1927	Conviction
Frye, Daniel W.	Avon	Stoughton	Jan. 17, 1928	Conviction
Gauthro, Vincent	Woburn	Woburn	Feb. 10, 1928	Discharged
Geboult, Henri	Sturbridge	Southbridge	June 8, 1928	Conviction
Geddes, John	Sharon	Dedham	Feb. 20, 1928	Conviction
George, Louis	Sturbridge	Southbridge	May 16, 1928	Conviction
Glidden, George P.	Dighton	Taunton	May 11, 1928	Discharged
Goja, Thomas	Westport	Fall River	Oct. 18, 1928	Conviction
Gratta, Antoni	Hull	Hingham	Aug. 31, 1928	Conviction
Harriman, Maynard S.	West Acton	Concord	May 21, 1928	Conviction
Holmes, Floyd	West Bridgewater	Brockton	Nov. 26, 1928	Conviction
Kuhn, Richard D.	Southampton	Northampton	Nov. 1, 1928	Conviction ¹
Kulesza, Klemens	South Hadley	Northampton	June 7, 1928	Conviction
Lewis, John	Westport	Fall River	Aug. 21, 1928	Discharged
Mederos, Frank R.	Taunton	Taunton	Apr. 13, 1928	Conviction ¹
Mendoza, John	Assonet	Taunton	Apr. 13, 1928	Conviction
Meszecnski, John	West Oxford	Webster	June 14, 1928	Conviction
Mitchell, Frank	Attleboro	Attleboro	Dec. 5, 1927	Conviction
Newhall, Frank C.	Lynnfield	Peabody	Nov. 30, 1928	Conviction
Peabody, Eugene L.	Foxborough	Franklin	May 3, 1928	Conviction
Reid, James	Raynham	Taunton	Jan. 26, 1928	Conviction
Reid, Jr., James	Taunton	Taunton	Apr. 27, 1928	Conviction
Reid, Jr., James	Raynham	Taunton	Sept. 25, 1928	Discharged

¹ Appealed.

For Sale of Milk containing Added Water — Concluded.

NAME.	Address.	Court.	Date.	Result.
Stampien, Joseph . . .	Dracut . . .	Lowell . . .	Oct. 29, 1928	Conviction
Thompson, Frederick . .	Westwood . . .	Dedham . . .	Sept. 18, 1928	Conviction
Thompson, Levi H. . .	Greenfield . . .	Greenfield . .	Apr. 5, 1928	Conviction ¹
Tieuli, Frank . . .	Milford . . .	Milford . . .	Apr. 20, 1928	Conviction
Tremblay, Thurphile . .	Sturbridge . . .	Southbridge . .	June 8, 1928	Conviction
Wesolowski, John . . .	Cheshire . . .	Adams . . .	Oct. 19, 1928	Conviction
Williams, Jessica . . .	Southbridge . .	Southbridge . .	Sept. 28, 1928	Discharged
Zack, Mike . . .	Hadley . . .	Northampton . .	Sept. 25, 1928	Conviction ¹

For Sale of Cream not of Good Standard Quality.

Janopoulos, Louis . . .	Dedham . . .	Dedham . . .	Apr. 8, 1928	Conviction
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For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products.

CIDER.

[Misbranded.]

Millman, Simon . . .	Roxbury . . .	Roxbury . . .	Jan. 20, 1928	Conviction ¹
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CLAMS.

[Sewage polluted.]

Doane, Samuel C. . .	South Boston . .	South Boston . .	Aug. 8, 1928	Discharged
Duffy, Joseph . . .	Revere . . .	Boston . . .	Mar. 21, 1928	Conviction ¹
Finn, William E. . .	Middleborough . .	Fall River . . .	Nov. 20, 1928	Conviction
Finn, William E. . .	Middleborough . .	Fall River . . .	Nov. 20, 1928	Conviction ¹
Marie, Walter R. . .	West Lynn . . .	Boston . . .	Mar. 21, 1928	Conviction ¹
McIntire, George S. . .	Essex . . .	Boston . . .	Sept. 18, 1928	Dismissed.

CLAMS.

[Contained added water.]

Beatton, Eugene P. . .	Saugus . . .	Lynn . . .	Mar. 8, 1928	Discharged
Crowell, James O. . .	Lynn . . .	Lynn . . .	Mar. 8, 1928	Discharged
Dennis, William F. . .	Marblehead . . .	Marblehead . .	Mar. 27, 1928	Conviction
Duffy, Joseph . . .	Revere . . .	Boston . . .	Mar. 21, 1928	Conviction ¹
Lessard, Edgar . . .	Hampton, N. H. . .	Lawrence . . .	Apr. 11, 1928	Conviction
Marie, Walter R. . .	West Lynn . . .	Boston . . .	Mar. 21, 1928	Conviction ¹
Smart, Phillip A. . .	Lynn . . .	Boston . . .	Mar. 21, 1928	Conviction ¹
St. John, Walter . . .	East Boston . . .	Boston . . .	Mar. 21, 1928	Conviction ¹
Thorner, Owen H. . .	Marblehead . . .	Marblehead . .	Mar. 27, 1928	Conviction
Wells, Victor . . .	Winthrop . . .	Boston . . .	Mar. 21, 1928	Conviction ¹
Wells, Victor . . .	Winthrop . . .	Boston . . .	Mar. 21, 1928	Conviction ¹

DRIED FRUITS.

[Contained sulphur dioxide.]

Day, Lester F. . .	Gloucester . . .	Gloucester . . .	Mar. 7, 1928	Conviction
First National Stores, Inc.	Gloucester . . .	Gloucester . . .	Mar. 7, 1928	Conviction
Luffin, Andrew W. . .	Gloucester . . .	Gloucester . . .	Mar. 7, 1928	Conviction
Shackelford, Fred W. . .	Gloucester . . .	Gloucester . . .	Mar. 7, 1928	Conviction
Winer, Morris . . .	Salem . . .	Salem . . .	Jan. 17, 1928	Conviction

EGGS.

[Misbranded.]

Great Atlantic & Pacific Tea Company . . .	Pittsfield . . .	Pittsfield . . .	Dec. 29, 1927	Conviction
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HAMBURG STEAK.

[Selling, or offering for sale, meat containing sodium sulphite in violation of the regulations of the Department of Public Health.]

Gillis, Harry . . .	Boston . . .	Boston . . .	Jan. 30, 1928	Conviction
Hollis, Frank S. . .	Chelsea . . .	Chelsea . . .	Oct. 23, 1928	Conviction
Kolovson, Irving J. . .	Boston . . .	Boston . . .	Feb. 17, 1928	Conviction
Sawyer, Morris . . .	Taunton . . .	Taunton . . .	Jan. 28, 1927	Conviction

MAPLE SUGAR.

[Contained cane sugar other than maple.]

Drinkwater, Antonio . .	Chelsea . . .	Chelsea . . .	Apr. 2, 1928	Conviction ¹
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MAPLE SYRUP.

[Contained cane sugar.]

Alpha Lunch Company . .	Boston . . .	Boston . . .	Dec. 13, 1927	Conviction
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OLIVE OIL.

[Adulterated with foreign oil.]

Deconies, Thomas . . .	Providence, R. I. .	Attleboro . . .	Apr. 3, 1928	Conviction
United Importers, Incorporated . . .	Providence, R. I. .	Fall River . . .	May 29, 1928	Conviction ¹

¹ Appealed.

For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products — Concluded.

NAME.	Address.	Court.	Date.	Result.
SAUSAGE.				
[Contained starch in excess of 2 per cent.]				
Weitz, Carl A.	Somerville	Somerville	Jan. 19, 1928	Conviction
SAUSAGE.				
[Contained coloring matter.]				
Urquart, Herman	Providence, R. I.	Fall River	June 12, 1928	Conviction
SAUSAGE.				
[Contained a compound of sulphur dioxide not properly labeled.]				
Fugere, Lucien J.	Northampton	Northampton	Mar. 2, 1928	Conviction
Mohawk Sausage & Provision Company	Boston	Salem	Jan. 7, 1928	Conviction
Queior, George	Chicopee	Chicopee	Dec. 16, 1927	Conviction
SCALLOPS.				
[Contained added water.]				
Great Atlantic & Pacific Tea Company	North Attleborough	Attleboro	Dec. 12, 1927	Conviction

For Violation of the Oleomargarine Law.

Kanelos, Nicholas	Adams	Adams	June 15, 1928	Discharged
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For Sale of Decomposed Food.

EGGS.				
Great Atlantic & Pacific Tea Company	Watertown	Waltham	Sept. 11, 1928	Conviction
Dairymaid Creamery Company	Allston	Brighton	Oct. 17, 1928	Conviction

False and Misleading Advertising.

CREAM.				
[Not standard cream.]				
Meader, Walter C.	Clinton	Clinton	June 29, 1928	Discharged

EGGS.				
[Sale of eggs which were not fresh as fresh eggs.]				
Abrahams, Morris	Pittsfield	Pittsfield	Dec. 15, 1927	-1
Bay State Tea & Butter Corporation	Athol	Athol	Nov. 13, 1928	Conviction
Burch, Charles W.	Provincetown	Provincetown	Sept. 20, 1928	Conviction
Cloverdale Company	Plymouth	Plymouth	Oct. 16, 1928	Conviction ²
Daigneau, Alfred	Lynn	Lynn	Jan. 18, 1928	Conviction
Daigneau, Alfred	Lynn	Lynn	Jan. 18, 1928	Conviction
Gold, Carl	Springfield	Springfield	Jan. 20, 1928	Conviction
Great Atlantic & Pacific Tea Company	Pittsfield	Pittsfield	Dec. 29, 1927	Conviction
Great Atlantic & Pacific Tea Company	Newtonville	Newton	Sept. 4, 1928	Conviction
Great Atlantic & Pacific Tea Company	Cambridge	Cambridge	Sept. 21, 1928	Conviction
Kronick, Samuel	Athol	Athol	Nov. 13, 1928	Conviction
Levine, Benjamin	Newton	Newton	Sept. 4, 1928	Conviction
Manhattan Five & Ten Cent Store Inc.	Cambridge	Cambridge	Oct. 31, 1928	Conviction
Massachusetts Mohican Company	Pittsfield	Pittsfield	Dec. 29, 1927	Conviction
Mayflower Stores	Attleboro	Attleboro	Dec. 12, 1927	Conviction
Phillips Inc., A. H.	Chicopee	Chicopee	Feb. 3, 1928	Conviction
Phillips Inc., A. H.	Easthampton	Northampton	Nov. 1, 1928	Conviction
Tillman, Samuel	Springfield	Springfield	Feb. 9, 1928	Conviction
United Food Shop, Incorporated	Watertown	Waltham	Nov. 21, 1928	Conviction
Widlansky, Isaac	Springfield	Springfield	Jan. 20, 1928	Conviction
Wright, Arthur	Newton	Newton	Aug. 24, 1928	Conviction
Zicko, John	Natick	Natick	Nov. 30, 1928	Conviction

MAPLE SUGAR.				
Kanelos, Nicholas	Adams	Adams	June 15, 1928	Conviction

¹ Nolo contendere; on file.

² Appealed.

False and Misleading Advertising — Concluded.

NAME.	Address.	Court.	Date.	Result.
MAPLE SYRUP.				
Abrahams, Morris	Pittsfield	Pittsfield	Dec. 15, 1927	Conviction
Alpha Lunch Company	Boston	Boston	Dec. 13, 1927	Conviction
Angelos, Charles	Chelsea	Chelsea	Sept. 18, 1928	Conviction
Apostolu, George	Hull	Hingham	Aug. 31, 1928	Conviction
Bakirakis, Nicholas	Taunton	Taunton	Jan. 26, 1928	Conviction
Brogan, Frank D.	Hyannis	Barnstable	Nov. 1, 1928	Discharged
Dennis, Anastos K.	Cambridge	Cambridge	Dec. 19, 1927	Conviction
Diamond, Steven	Chelsea	Chelsea	Sept. 18, 1928	Conviction
Doomonsalis, Peter	Frammingham	Frammingham	May 4, 1928	Conviction
Fonkrotis, Philip	Bridgewater	Brockton	July 2, 1928	Conviction
Georgenes, Peter	Hull	Hingham	Aug. 31, 1928	Conviction
Georgian Cafeteria Com- pany	Cambridge	Cambridge	Dec. 30, 1927	Conviction ¹
Girard, Wilbur A.	Southbridge	Southbridge	Oct. 19, 1928	Conviction
Grammas, Peter G.	Gloucester	Gloucester	Oct. 24, 1928	Conviction
Kacavas, George E.	Boston	Boston	Dec. 20, 1927	Conviction
Manjoratos, Peter	Natick	Natick	May 7, 1928	Conviction
Mannolidis, John	Cambridge	Cambridge	Apr. 10, 1928	Conviction
Maravelias, Angelos	Lynn	Lynn	Nov. 9, 1928	Conviction
Marshall, William H.	Chelsea	Chelsea	Oct. 10, 1928	Conviction
Papastathis, William	Roxbury	Roxbury	Jan. 24, 1928	Conviction
Pappas, Christos	Hull	Hingham	Sept. 17, 1928	Conviction
Pride, John	Frammingham	Frammingham	May 4, 1928	Conviction
Ptsakeres, Nicholas	Boston	Boston	Dec. 6, 1927	Conviction
Pupulias, James	Boston	Boston	Dec. 7, 1927	Conviction
Rodakis, Philip	Lynn	Lynn	Nov. 9, 1928	Conviction
Seretely, Mitchell	Hyannis	Barnstable	Nov. 1, 1928	Conviction
Shtung, Harry	Lynn	Lynn	Nov. 9, 1928	Conviction
Solovicos, Manuel	Salem	Salem	Dec. 30, 1927	Conviction ¹
Storiow, Approcratis	Stoughton	Stoughton	Aug. 6, 1928	Conviction
Steers, George L.	Waltham	Waltham	Nov. 21, 1928	Conviction
Sykes, Paul C.	Cambridge	Cambridge	Apr. 3, 1928	Conviction
Vasilajis, Ethmos	Cambridge	Cambridge	Jan. 9, 1928	Conviction
Wong, Paul	Northampton	Northampton	Nov. 1, 1928	Conviction
Zografos, Michael	Waltham	Waltham	Jan. 25, 1928	Conviction

For Sale of Drugs Deficient in Strength.

SWEET SPIRIT OF NITRE.				
Clark, John	Athol	Athol	Oct. 29, 1928	Conviction
Harriman, James F.	Winthrop	Attleboro	Feb. 13, 1928	Conviction
The Imperial Drug Com- pany	Fitchburg	Fitchburg	Oct. 17, 1928	Conviction

For Violation of the Laws relative to Cold Storage.

SELLING COLD STORAGE EGGS WITHOUT MARKING THE CONTAINER.				
Amazon, Abraham	Pittsfield	Pittsfield	Dec. 15, 1927	Conviction
Beastalk, Barney	Peabody	Peabody	Feb. 15, 1928	Conviction
Bezereanarkis, Nicholas	Salem	Salem	Jan. 17, 1928	Conviction
Bogosien, George	Cambridge	Cambridge	Jan. 16, 1928	Conviction
Castalina, Nathan	Roxbury	Roxbury	Jan. 24, 1928	Conviction
Caswell, Bessie	Lynn	Lynn	Jan. 24, 1928	Conviction
Connolly, Richard	Salem	Salem	Dec. 2, 1927	Conviction
Diorio, Michael	Salem	Salem	Dec. 2, 1927	Conviction ¹
First National Stores, In- corporated	Newton	Newton	Jan. 10, 1928	Conviction
First National Stores, In- corporated	Brighton	Brighton	Jan. 19, 1928	Conviction
First National Stores, In- corporated	Dorchester	Dorchester	Jan. 23, 1928	Conviction
Gaudreault, Mederic	Salem	Salem	Jan. 17, 1928	Conviction
Gauthier, William G.	Attleboro	Attleboro	Dec. 5, 1927	Conviction
Gray Company, E. E.	Waltham	Waltham	Jan. 25, 1928	Conviction
Great Atlantic & Pacific Tea Company	Newton	Newton	Jan. 20, 1928	Conviction
Gritsko, Clement	Peabody	Peabody	Feb. 3, 1928	Conviction
Hatfield, George	Fairhaven	New Bedford	Jan. 27, 1928	Conviction
Hyder, Abdella	Lawrence	Lawrence	Mar. 9, 1928	Conviction ¹
Kaplan, Myer	Boston	Boston	Jan. 9, 1928	Conviction
LaPidis, Joseph	Boston	Boston	Jan. 9, 1928	Conviction
Leone, Guivanni	Lawrence	Lawrence	Dec. 5, 1927	Conviction
Moleska, Stanley	Pittsfield	Pittsfield	Dec. 29, 1927	Conviction
Mooka, Michael	Peabody	Peabody	Feb. 3, 1928	Conviction
Mosca, Gregory	Pittsfield	Pittsfield	Dec. 15, 1927	Conviction
Noel, Jaddus	Athol	Athol	Nov. 13, 1928	Conviction
Olivieri, Felix	Newton	Newton	Feb. 13, 1928	Conviction
Polonsky, Barnard	Salem	Salem	Jan. 17, 1928	- 2
Pralenski, Pale	Athol	Athol	Nov. 13, 1928	Conviction
Provencher, Sarah L.	Salem	Salem	Jan. 17, 1928	Conviction
Puritan Stores, Inc.	Fairhaven	New Bedford	Jan. 27, 1928	Conviction
Roguski, Alexander	Lawrence	Lawrence	Dec. 9, 1927	Conviction

¹ Appealed.² Nolo contendere; on file.

For Violation of the Laws relative to Cold Storage — Concluded.

NAME.	Address.	Court.	Date.	Result.
SELLING COLD STORAGE EGGS WITHOUT MARKING THE CONTAINER — Concluded.				
Sessine, Samuel R.	Brighton	Brighton	Jan. 19, 1928	Conviction
Shore, Abraham	Chelsea	Chelsea	Nov. 28, 1928	Conviction
Staropulous, George	Roxbury	Roxbury	Jan. 24, 1928	Conviction
Szynaski, Alex	Pittsfield	Pittsfield	Feb. 24, 1928	Conviction
Tillman, Samuel	Springfield	Springfield	Feb. 9, 1928	Conviction
Venditti, Louis	Newton	Newton	Jan. 31, 1928	Conviction
Winer, Morris	Salem	Salem	Jan. 17, 1928	Conviction
Wollan, John	Stoughton	Stoughton	Jan. 17, 1928	Conviction

REPRESENTING COLD STORAGE FOOD AS FRESH FOOD.

First National Stores, Incorporated	Watertown	Waltham	Feb. 14, 1928	Conviction
Gold, David	Springfield	Springfield	Feb. 9, 1928	Dismissed

For Violations of the Laws relative to Slaughtering.

SLAUGHTERING WITHOUT LICENSE.

Cole, Walter	Berlin	Clinton	June 12, 1928	Conviction
Gould, Louis	Clinton	Clinton	May 12, 1928	Conviction

SLAUGHTERING OR AUTHORIZING SLAUGHTERING IN THE ABSENCE OF INSPECTOR.

Brown, Louis	Springfield	Springfield	June 27, 1928	Conviction
Cole, Walter	Berlin	Clinton	June 12, 1928	Conviction
Davis, Salim	Agawam	Springfield	May 18, 1928	Conviction
Gould, Louis	Clinton	Clinton	May 12, 1928	Conviction
Maspo, James	Springfield	Springfield	Apr. 18, 1928	Conviction

SELLING, OFFERING FOR SALE, OR HAVING IN POSSESSION WITH INTENT TO SELL, UNSTAMPED MEAT.

Foskett, Frank	East Woodstock, Conn.	Webster	Sept. 25, 1928	Conviction
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AS INSPECTOR OF SLAUGHTERING, VIOLATED THE REGULATIONS OF THE DEPARTMENT.

Chaplin, Marshall E.	Berlin	Clinton	June 12, 1928	Conviction
Kelso, John	Chester	Westfield	Jan. 20, 1928	Conviction

For Violation of the Pasteurization Law.

Arnold, Henry	Agawam	Springfield	June 14, 1928	Conviction
Baker Brothers	Lanesborough	Pittsfield	Aug. 9, 1928	Conviction
Baker Brothers	Lanesborough	Pittsfield	Aug. 9, 1928	Conviction
Barraffaldi, Alphonse	West Springfield	Springfield	June 14, 1928	Conviction
Gubola, Léo	North Wilbraham	Palmer	June 13, 1928	Conviction
O'Neil, Edward	West Springfield	Springfield	June 14, 1928	Conviction
Richardson, Hazen K.	Middleton	Salem	June 15, 1928	Conviction
Walpole, Thomas Frank	Haydenville	Northampton	June 7, 1928	Conviction
Wood, Ellis	Lanesborough	Pittsfield	Aug. 9, 1928	Conviction
Wood, Ellis	Lanesborough	Pittsfield	Aug. 9, 1928	Conviction

For Violation of the Mattress Laws.

Antiseptic Mattress Company	Lynn	Somerville	Jan. 17, 1928	Discharged
Goldberg, William	Dorchester	Dorchester	June 25, 1928	Conviction
Green, Louis	East Boston	East Boston	Oct. 9, 1928	Conviction
Green, Louis	East Boston	East Boston	Oct. 9, 1928	Conviction
Green, Louis	East Boston	East Boston	Oct. 9, 1928	Conviction
Green, Louis	East Boston	East Boston	Oct. 9, 1928	Conviction
New Angle Spring Bed Company	Chelsea	East Boston	Oct. 16, 1928	Discharged
New Angle Spring Bed Company	Chelsea	East Boston	Oct. 16, 1928	Discharged

TABLE 2. — *Summary of Milk Analyses for the Year 1928.*

Number above the standard	6,823
Number below the standard	2,008
	8,831
Number having more than 15 per cent total solids	49
Number having between 14 per cent and 15 per cent total solids	206
Number having between 13 per cent and 14 per cent total solids	1,061
Number having between 12 per cent and 13 per cent total solids	5,507
Number having between 11 per cent and 12 per cent total solids	1,727
Number having between 10 per cent and 11 per cent total solids	227
Number having between 9 per cent and 10 per cent total solids	41
Number having between 8 per cent and 9 per cent total solids	8
Number having less than 8 per cent total solids	5
Number of samples having cream removed	228
Number of samples of watered milk	215

TABLE 3. — *Summary of Milk Analyses, 1928.*

MONTH.	ALL SAMPLES.				SAMPLES NOT DECLARED ADULTERATED.			
	Samples.	Average Solids (Per Cent).	Average Fat (Per Cent).	Average Solids not Fat (Per Cent).	Samples.	Average Solids (Per Cent).	Average Fat (Per Cent).	Average Solids not Fat (Per Cent).
December	394	12.48	3.74	8.74	382	12.52	3.77	8.75
January	507	12.42	3.71	8.71	463	12.60	3.79	8.81
February	519	12.51	3.74	8.77	499	12.60	3.78	8.62
March	760	12.54	3.75	8.79	733	12.59	3.80	8.79
April	851	12.31	3.64	8.67	802	12.41	3.69	8.72
May	862	12.26	3.64	8.62	816	12.32	3.68	8.64
June	794	12.35	3.66	8.69	762	12.41	3.71	8.70
July	698	12.20	3.61	8.59	646	12.33	3.70	8.63
August	809	12.24	3.69	8.55	770	12.32	3.76	8.57
September	700	12.20	3.62	8.58	651	12.29	3.68	8.61
October	911	12.43	3.80	8.63	876	12.50	3.84	8.65
November	881	12.47	3.78	8.69	843	12.57	3.82	8.75
Total	8,686	12.37	3.71	8.66	8,243	12.45	3.77	8.78

TABLE 4. — *Liquor Report for 1928.*
Character of Samples.

CITIES AND TOWNS.	Beer.	Cider.	Wine.	Distilled Spirits.	Extracts.	Alcohol.	Miscellaneous.	Total.
Adams	17	1	—	4	—	4	—	26
Amesbury	7	1	4	8	—	8	1	29
Belmont	9	1	4	13	—	1	2	30
Beverly	14	—	11	4	—	4	—	33
Boston	310	2	170	1,598	2	420	270	2,772
Braintree	10	—	2	16	—	4	—	32
Cambridge	82	—	57	302	—	42	33	516
Chelsea	38	—	1	112	—	7	3	161
Clinton	2	3	2	26	—	11	6	50
Everett	27	—	25	30	—	13	3	98
Fall River	23	—	6	35	—	—	3	67
Fitchburg	47	4	13	16	—	18	1	99
Gardner	44	1	7	24	—	6	5	87
Haverhill	44	—	15	13	—	—	—	72
Ipswich	16	2	3	5	—	—	—	26
Lawrence	77	—	25	93	—	19	2	216
Leominster	13	—	5	11	—	10	2	41
Lowell	323	—	5	250	—	51	81	710
Lynn	22	—	15	177	—	55	13	282
Malden	24	—	9	196	—	16	10	255
Marlborough	11	—	1	13	—	7	5	37
Medford	7	—	3	28	—	2	—	40
Northampton	9	—	2	23	—	6	2	42
Norwood	7	—	1	20	—	1	6	35
Peabody	10	—	3	40	—	7	—	60
Pittsfield	36	1	7	51	—	10	1	106
Quincy	10	—	8	36	—	13	2	69
Revere	16	—	10	21	—	4	2	53
Salem	32	—	20	37	—	26	2	117
Somerville	25	—	11	143	—	11	4	194
Southbridge	20	—	—	10	—	—	2	32
Springfield	72	1	41	169	—	7	12	302
Stoughton	10	—	3	13	—	1	—	27
Tewksbury	31	—	3	5	—	—	—	39
Wakefield	2	—	5	14	—	4	—	25
Waltham	16	—	13	13	—	11	3	56
Watertown	13	—	7	17	—	7	2	46
Webster	25	—	—	3	—	1	—	29
Weymouth	14	—	4	29	—	4	1	52
Woburn	10	—	1	19	—	2	2	34
Department of Public Safety	272	10	61	409	—	35	23	810
Miscellaneous ¹	267	26	98	354	—	82	33	860
Totals	2,064	53	681	4,400	2	930	537	8,667

¹ From 109 towns submitting less than twenty-five samples each.

TABLE 5. — *Summary of Carcasses inspected from December 1, 1927, through November 30, 1928.*

Total Number of Carcasses Inspected	180,487
Cattle	24,612
Calves	89,379
Hogs	59,567
Sheep	6,929
Total Number of Carcasses Condemned	2,597
Cattle	427
Calves	1,553
Hogs	574
Sheep	43

REASONS FOR CONDEMNATION.	Cattle.	Calves.	Hogs.	Sheep.	Total.
Immaturity	—	1,387	59	18	1,464
Tuberculosis	350	57	113	6	526
Cholera	—	—	249	—	249
Pneumonia	7	5	60	2	74
Died otherwise than by slaughter	19	33	8	2	62
Bruised	17	23	6	3	49
Emaciation	4	4	22	1	31
Septicemia	8	1	6	7	22
Yellow Jaundice	—	8	7	1	16
Urticaria	—	—	10	—	10
Milk fever	2	1	6	—	9
Scours	1	6	—	—	7
Premature	—	6	1	—	7
Diarrhea	1	6	—	—	7
Slaughtered in Inspector's absence	—	5	1	—	6
Sores	2	—	4	—	6
Tumor	1	—	4	—	5
Bitten by dogs	—	—	2	3	5
Poisoned	2	—	2	—	4
Navel ill	—	3	—	—	3
Erysipelas	—	—	3	—	3
Unfit for food	1	1	1	—	3
Abscess	2	1	—	—	3
Cirrhosis of liver	1	—	1	—	2
General debility	—	2	—	—	2
Spotted liver	—	—	2	—	2
Local infection	—	—	2	—	2
Ruptured	—	1	1	—	2
Internal hemorrhage	—	1	—	—	1
Tympanitis	—	1	—	—	1
Inflammation of udder	1	—	—	—	1
Enlargement of liver	—	—	1	—	1
Parturition	1	—	—	—	1
Tetanus	—	—	1	—	1
Frozen leg	—	—	1	—	1
Exhaustion	1	—	—	—	1
Cancer	1	—	—	—	1
Constipation	—	—	1	—	1
Dropsy	1	—	—	—	1
Paralyzed	1	—	—	—	1
Gangrene	1	—	—	—	1
Colic	1	—	—	—	1
Still born	—	1	—	—	1
Slaughtered without a license	1	—	—	—	1
Total	427	1,553	574	43	2,597

TABLE 6. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1927, to December 1, 1928.*

[Reason for such extension being that goods were in proper condition for further storage.]

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Butter	3,162	May 5, 1927	June 5, 1928	Lewis, Mears Co.
Butter	480	May 26, 1927	Aug. 1, 1928	McDonald, J. N., Co.
Eggs, mixed	15,000	Apr. 25, 1927	Sept. 1, 1928	Layton, The John, Co., Inc.
Eggs, mixed	15,000	Apr. 25, 1927	Sept. 1, 1928	Layton, The John, Co., Inc.
Eggs, mixed	6,990	May 5, 1927	July 1, 1928	Lowe, Joe, Co., Inc.
Eggs, mixed	24,750	May 19, 1927	Sept. 1, 1928	Stone, Charles H., Co.
Eggs, mixed	38,400	May 19, 1927	Aug. 15, 1928	Stone, Charles H., Co.
Egg whites	9,000	May 9, 1927	Sept. 1, 1928	Layton, The John, Co., Inc.
Egg whites	4,500	May 12, 1927	Aug. 12, 1928	Lewis, Mears Co.
Egg whites	9,300	Mar. 21, 1927	June 1, 1928	Lowe, Joe, Co., Inc.
Egg whites	36,000	June 10, 1927	Dec. 10, 1928	Titman Egg Co.
Egg whites	33,000	June 23, 1927	Dec. 23, 1928	Titman Egg Co.
Egg whites	960	July 5, 1927	Jan. 5, 1929	Titman Egg Co.
Egg whites	36,000	July 5, 1927	Jan. 5, 1929	Titman Egg Co.

TABLE 6. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1927, to December 1, 1928 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Egg yolks	6,600	Oct. 1926	July 1, 1928	Layton, The John, Co., Inc.
Egg yolks	8,800	Oct. 1926	Apr. 1, 1928	Layton, The John, Co., Inc.
Egg yolks	11,000	Oct. 1926	Apr. 1, 1928	Layton, The John, Co., Inc.
Egg yolks	44,000	Oct. 1926	July 1, 1928	Layton, The John, Co., Inc.
Egg yolks	450	May 5, 1927	Aug. 1, 1928	Lowe, Joe, Co., Inc.
Egg yolks	20,504	June 1, 1927	July 1, 1928	Swift & Co.
Turkeys	334	Dec. 29, 1926	Apr. 1, 1928	Jackson, Lucy A.
Deer meat	20	Jan. 6, 1927	Apr. 1, 1928	Brandberg, Christina
Venison	76	Nov. 15, 1927	Feb. 1, 1929	Davis, Fred E.
Venison	188	Nov. 10, 1926	Apr. 6, 1928	Woodward, George C.
Beef loins	770	Dec. 31, 1926	Feb. 1, 1928	Batchelder & Snyder Co.
Beef loins	314	June 13, 1927	Sept. 8, 1928	Swift & Co.
Beef loins	637	June 14, 1927	Sept. 8, 1928	Swift & Co.
Beef loins	1,332	June 14, 1927	Sept. 8, 1928	Swift & Co.
Beef loins	122	June 16, 1927	Sept. 8, 1928	Swift & Co.
Beef loins	337	June 16, 1927	Sept. 8, 1928	Swift & Co.
Beef loins	568	June 16, 1927	Sept. 8, 1928	Swift & Co.
Beef loins	836	June 16, 1927	Sept. 8, 1928	Swift & Co.
Choggies	420	Nov. 15, 1927	Jan. 15, 1929	Drape, Louis A., Inc.
Choggies	413	Nov. 16, 1927	Jan. 16, 1929	Drape, Louis A., Inc.
Choggies	1,250	Nov. 17, 1927	Jan. 17, 1929	Drape, Louis A., Inc.
Choggies	1,240	Nov. 23, 1927	Jan. 23, 1929	Drape, Louis A., Inc.
Pork loins	4,934	Jan. 21, 1927	Mar. 1, 1928	Handy, H. L., Co.
Pork loins	1,800	Mar. 7, 1927	May 7, 1928	Kent Brothers Corporation
Cod	2,906	Sept. 10, 1927	Dec. 10, 1928	Coleman & Sons Co.
Halibut	5,775	Feb. 21, 1928	Mar. 30, 1929	Atwood & Co.
Halibut	200	Sept. 10, 1927	Jan. 10, 1929	Burns, McKeon Co.
Halibut	460	Oct. 24, 1927	Jan. 24, 1929	Burns, McKeon Co.
Halibut	1,746	Oct. 4, 1927	Jan. 4, 1929	Coleman & Sons Co.
Halibut	400	Aug. 10, 1927	Dec. 10, 1928	Corso & Gambino Co.
Halibut	348	July 27, 1927	Dec. 27, 1928	Mantia, S., & Co.
Halibut	4,500	May 2, 1927	Nov. 2, 1928	New England Fish Co.
Halibut	1,000	July 7, 1927	Dec. 7, 1928	New England Fish Co.
Halibut	1,650	July 21, 1927	Dec. 21, 1928	New England Fish Co.
Halibut	505	Aug. 4, 1927	Dec. 4, 1928	New England Fish Co.
Halibut	1,130	Oct. 11, 1927	Jan. 11, 1929	New England Fish Co.
Halibut	2,000	Oct. 11, 1927	Jan. 11, 1929	New England Fish Co.
Halibut	850	Oct. 19, 1927	Jan. 19, 1929	New England Fish Co.
Halibut	2,400	Nov. 2, 1927	Dec. 20, 1928	New England Fish Co.
Halibut	1,000	Aug. 10, 1927	Nov. 10, 1928	Ocean Fish Corporation
Herring	22,800	Sept. 20, 1927	Jan. 1, 1929	Collins-Lee Co.
Herring	2,000	Oct. 1, 1927	Jan. 1, 1929	Collins-Lee Co.
Herring	300	Sept. 1, 1927	Dec. 1, 1928	Goodspeed, L. B., & Co.
Herring	600	Mar. 17, 1928	Jan. 1, 1929	Nagle, John C.
Herring ¹	100,000	May 15, 1927	Apr. 15, 1928	Parker Fish Freezer Co.
Mackerel fillets	450	June 30, 1927	July 30, 1928	Morse, D. J.
Pollock	5,700	Dec. 21, 1926	Jan. 30, 1928	Atlantic & Pacific Fish Co.
Salmon	904	Oct. 26, 1927	Jan. 26, 1929	Burns, McKeon Co.
Scallops	1,830	Aug. 1, 1927	Jan. 1, 1929	Bain, A. A.
Scallops	3,810	Aug. 9, 1927	Jan. 1, 1929	Bain, A. A.
Scallops	1,455	Aug. 16, 1927	Jan. 1, 1929	Bain, A. A.
Scallops	1,080	Oct. 20, 1927	Dec. 1, 1928	Drape, Louis A., Inc.
Scallops	1,480	July 30, 1927	Jan. 1, 1929	Meservey, C. A.
Scallops	1,190	Aug. 2, 1927	Jan. 1, 1929	Meservey, C. A.
Scallops	2,027	Aug. 6, 1927	Jan. 1, 1929	Meservey, C. A.
Scallops	2,439	Aug. 1, 1927	Jan. 1, 1929	Whitney, S. P.
Scallops	2,620	Aug. 2, 1927	Jan. 1, 1929	Whitney, S. P.
Scallops	4,780	Aug. 16, 1927	Jan. 1, 1929	Whitney, S. P.
Scup	3,400	May 23, 1927	Dec. 23, 1928	Russo & Sons
Scup	5,950	May 23, 1927	Dec. 23, 1928	Russo & Sons
Scup	925	May 27, 1927	Dec. 27, 1928	Russo & Sons
Scup	690	June 15, 1927	Dec. 15, 1928	Russo & Sons
Scup	2,050	June 15, 1927	Dec. 15, 1928	Russo & Sons
Scup	5,000	June 20, 1927	Dec. 20, 1928	Russo & Sons
Scup	590	July 1, 1927	Dec. 1, 1928	Russo & Sons
Shark	350	Aug. 19, 1927	Dec. 19, 1928	Russo & Sons
Smelts	1,125	Oct. 11, 1927	Dec. 31, 1928	Harding, F. E., Co.
Swordfish	415	Aug. 17, 1927	Nov. 17, 1928	Burns, McKeon Co.

TABLE 7. — *Requests for Extension of Time not granted on Goods in Cold Storage from December 1, 1927, to December 1, 1928.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Eggs	2,310	Oct. 1926	Layton, The John, Co., Inc.
Eggs	4,334	Oct. 1926	Layton, The John, Co., Inc.
Eggs	12,150	Apr. 1, 1927	Stone, Charles H., Co.
Broilers	50	Nov. 24, 1926	Kimball Poultry Co., Inc.
Beef	25,132	Apr. 5, 1927	Knight, Custer
Beef	25,237	Apr. 5, 1927	Knight, Custer
Beef	29,264	Apr. 5, 1927	Knight, Custer
Beef	30,792	Apr. 5, 1927	Knight, Custer
Ciscoes	550	Dec. 14, 1926	Spivak, F.

¹ Bait.

TABLE 7. — *Requests for Extension of Time not granted on Goods in Cold Storage from December 1, 1927, to December 1, 1928 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Scallops	7,860	Aug. 9, 1927	Whitney, S. P.
Scup	200	June 27, 1927	Tocco, Joe
Shark	40	Aug. 24, 1927	Russo & Sons
Shark	200	July 23, 1927	Tocco, Joe
Shark	117	July 27, 1927	Tocco, Joe
Squid	75	June 29, 1927	Tocco, Joe
Whitefish	175	Dec. 13, 1926	Spivak, F.

TABLE 8. — *Articles which had been in Cold Storage Longer than Twelve Months and on which no Requests for Extensions had been made, ordered removed from December 1, 1927, to December 1, 1928.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Eggs	2,440	Apr. 1926	Layton, The John, Co., Inc.
Eggs	1,960	Oct. 1926	Layton, The John, Co., Inc.
Eggs	2,040	Oct. 1926	Layton, The John, Co., Inc.
Eggs	1,880	Apr. 25, 1927	Layton, The John, Co., Inc.
Egg whites	690	May 4, 1927	Brown, M., & Sons
Egg whites	4,800	Apr. 1, 1927	Stone, C. H., & Co.
Broilers	90	Jan. 6, 1927	Lawrence, H. L., Co.
Capons	180	Feb. 24, 1927	Hutchinson, W. K., Co.
Chickens	60	Nov. 19, 1926	Alley, Greene & Pipe Co.
Chickens	1,130	Nov. 8, 1926	Childs, Sleeper & Co.
Chickens	451	Jan. 10, 1927	Lawrence, H. L., Co.
Chickens	213	Dec. 27, 1926	Pratt, F. B., Co.
Ducks	39	Dec. 2, 1926	Lawrence, H. L., Co.
Fowl	3,598	Dec. 11, 1926	Armour & Co.
Fowl	8,250	Dec. 17, 1926	Armour & Co.
Fowl	2,244	Dec. 24, 1926	Armour & Co.
Fowl	550	Aug. 23, 1927	Hosmer, F. H., & Co.
Fowl	900	Aug. 23, 1927	Hosmer, F. H., & Co.
Fowl	2,400	Aug. 23, 1927	Hosmer, F. H., & Co.
Geese	150	Dec. 29, 1926	Lagrange Street Market
Poultry	3,966	Dec. 15, 1926	Armour & Co.
Roasters	400	Feb. 16, 1927	Armour & Co.
Turkeys	5,037	Dec. 24, 1926	Armour & Co.
Turkeys	2,024	Dec. 31, 1926	Armour & Co.
Turkeys	218	Dec. 29, 1926	Childs, Sleeper & Co.
Turkeys	420	Dec. 29, 1926	Childs, Sleeper & Co.
Turkeys	260	Nov. 30, 1926	Hurley, T. F.
Turkeys	215	Dec. 31, 1926	Hutchinson, W. K., Co.
Turkeys	218	Dec. 28, 1926	Moran, Thomas F., Co.
Venison	206	Apr. 16, 1927	Cook, W. W.
Venison	50	Nov. 8, 1927	Rollins, S. R.
Venison	75	Nov. 17, 1927	Williams, E. G.
Venison	16	Nov. 17, 1927	Williams, G. A.
Beef	25,132	Apr. 5, 1927	Knight, Custer
Beef	25,237	Apr. 5, 1927	Knight, Custer
Beef	29,264	Apr. 5, 1927	Knight, Custer
Beef	30,792	Apr. 6, 1927	Knight, Custer
Beef cheek meat	400	June 1926	New England Dressed Meat & Wool Co.
Beef cheek meat	1,200	June 1926	New England Dressed Meat & Wool Co.
Chitterlings	963	Apr. 11, 1927	Rodman, Benjamin
Lamb	145	July 29, 1927	Hicks & Shaw, Inc.
Lamb	240	July 15, 1927	Kyes Supply Co.
Lamb	45	Dec. 14, 1926	Massachusetts Industrial School for Girls
Lamb	350	Dec. 17, 1926	Massachusetts Industrial School for Girls
Lamb	807	Dec. 31, 1926	Massachusetts Industrial School for Girls
Mutton	1,250	Jan. 14, 1926	New England Dressed Meat & Wool Co.
Pigs feet	1,000	Mar. 1927	Morris & Co.
Pigs tails	500	July 26, 1926	Sachem Provision Co.
Pork	255	July 16, 1927	Doane, H. W., Co.
Sweetbreads	50	Dec. 22, 1926	Batchelder & Snyder Co.
Veal	750	Dec. 11, 1926	New England Dressed Meat & Wool Co.
Veal legs	350	Jan. 3, 1927	New England Dressed Meat & Wool Co.
Ciscoes	200	Dec. 31, 1926	Previor, Phillip
Ciscoes	290	Dec. 15, 1926	Spivak, F.
Devilfish	65	Sept. 22, 1927	Tocco, Joe
Eels	175	Sept. 15, 1927	Tocco, Joe
Flounders	68	Sept. 6, 1927	Valencia Fish Co.
Haddock fillets	55	June 28, 1927	Collins-Lee Co.
Herring	350	Sept. 1, 1927	Rock, E. H.
Lobster	125	Dec. 22, 1926	Dennis, J.
Mackerel	157	Aug. 4, 1927	Banks Fish Market
Salmon	200	Aug. 8, 1927	Peas, William
Scallops	160	Oct. 10, 1927	Drape, Louis A., Inc.
Scallops	360	Oct. 18, 1927	Drape, Louis A., Inc.
Scallops	40	Sept. 1, 1927	Gifford, C. H.
Scup	400	June 18, 1927	Tocco, Joe
Shrimp	150	Dec. 21, 1926	Foley, M. F.
Shrimp	400	Dec. 30, 1927	Russo & Sons
Smelts	270	Jan. 21, 1927	Tocco, Joe
Whitefish	30	Dec. 17, 1926	Abrams, Sam

TABLE 9. — *Summary.*

Requests for extension of time granted	82
Butter	2
Eggs	18
Poultry	1
Game	3
Meat	14
Fish	44
Requests for extension of time not granted	16
Eggs	3
Poultry	1
Meat	4
Fish	8
Articles ordered removed from storage (no requests made)	70
Eggs	6
Poultry	23
Game	4
Meat	19
Fish	18

TABLE 10. — *Articles Other than Fish placed in Cold Storage from December 1, 1927, to December 1, 1928.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
December	.	.	.	.	.	.	.	.	.	.	.	.
January	814,892	479,070	307,379	83,618	1,385,827	439,523	707,518	262,353	469,715½	4,556,864	251,960	1,038,033
February	626,861	194,160	182,686	50,742	1,091,167	424,188	241,371	219,886	301,337	3,851,087½	79,978	993,616
March	424,202	119,820	499,208	22,446	290,647	331,453	297,363	194,826	138,939	4,434,768	20,058	1,366,951
April	612,275	725,010	437,277	38,168	242,401	458,538	154,699	276,722	214,349	3,453,077	15,288	1,449,285
May	186,705½	3,700,140	430,850	67,881	251,072½	111,079	84,101	114,423½	239,189	1,738,201	63,844	984,750
June	774,563	4,059,420	580,706	59,897½	239,926	331,460	42,342	227,210	629,359	1,693,752	48,383	1,108,714
July	5,525,096	2,797,850	912,391	45,752	146,859	340,170	41,151	289,615	390,485	2,982,722½	155,205	1,149,989
August	6,799,495	1,324,950	896,970	181,849	92,799	670,937	40,181	394,384	404,127	2,935,765	37,113	1,292,078
September	4,354,080	844,740	754,302	130,799	54,305	252,568	17,537	404,083½	462,799	2,162,975	27,293	1,487,264½
October	2,002,720	494,100	173,323	154,114	159,941	129,072	54,759	199,871	530,828	1,657,214	54,613	1,396,555
November	1,115,822	465,360	575,881	192,241	795,369	162,495	50,522	491,942	642,235	1,224,565	104,210	1,113,870
December	679,317	342,270	311,151	170,064	768,015	129,153	204,089½	264,745	789,906	1,669,610	296,274	1,159,929

TABLE 11. — *Articles Other than Fish on Hand in Cold Storage on the First Day of the Month, from January 1, 1928, through December 1, 1928.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
January	5,644,912	1,586,790	1,310,141½	1,010,551½	2,825,026½	813,686½	1,006,678	1,462,036½	2,236,082	6,835,583	603,910	2,869,918
February	3,159,175	97,260	936,686½	922,021½	3,657,969½	1,057,596½	1,108,722	1,416,283½	1,907,329	8,923,850½	557,647	2,045,825
March	1,723,715	28,260	717,963½	642,701½	3,458,432½	1,296,762½	1,361,102	1,138,193½	1,444,666	12,523,105½	472,791	3,173,223½
April	359,333	667,740	705,030½	532,969	2,888,502½	1,047,416½	1,342,556½	1,084,410½	1,160,486	14,274,405½	298,048	3,210,025
May	385,917½	4,203,210	878,050	400,987	2,137,847	1,007,212	1,101,615½	719,477	687,008	12,961,301½	34,107	2,759,067
June	7,928,940	7,328,940	1,087,742	259,179½	1,432,212	989,508	1,101,665½	684,490	851,585	12,393,501½	14,807	2,212,867½
July	5,868,069	10,345,500	1,602,501	162,764	915,530	1,082,279½	1,004,205½	800,692	923,710	12,639,794	111,590	2,102,822
August	11,828,198	10,964,970	2,050,653	267,125	495,058½	1,521,549½	898,577	1,012,795	957,977	12,118,632½	81,275	2,055,498
September	14,351,732	10,055,550	2,296,968	320,693	250,953½	1,256,709	640,174	1,082,493½	692,366½	9,901,383	78,623	2,185,012½
October	14,018,241	8,347,470	1,663,556	433,862½	290,400½	797,039½	545,117	1,085,403½	730,200½	6,908,355	105,562	2,363,119½
November	11,685,228	5,970,690	1,522,350	569,447	1,001,156½	629,868½	390,270½	1,319,897½	1,030,779½	4,650,375	194,140	2,186,889
December	8,652,495	3,367,845	1,263,459	686,760	1,661,396½	604,176½	293,521	1,313,455½	1,536,717½	3,913,529	474,537	2,472,943

TABLE 12. — *Fish placed in Cold Storage from December 15, 1927, to December 15, 1928.*

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall and Silver Salmon (Pounds).	Salmon, all Others (Pounds).	Shad (Pounds).	Smelt, Eula- chon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish. (Pounds).
January	456	43	15,731	130,459	326,966	298,948	64,278	154,565	9,870	—	88,651	174,958	7,977	9,756	134,874
February	—	—	3,141	84,470	33,444	393,061	62,378	42,800	38,339	—	369,445	93,724	—	81,785	93,339
March	828	2,443	5,360	109,073	76,825	733,165	117,808	6,794	3,098	2,303	222,863	114,016	1,973	8,624	124,192
April	—	50	3,160	369,580	6,578	286,800	1,540	775	—	—	14,778	4,961	—	—	173,800
May	—	—	8,120	263,602	152,767	225,971	6,503	4,938	1,000	3,909	1,569	837,735	—	—	271,157
June	—	2,580	8,700	371,580	61,694	55,303	2,950,947	497	2,150	4,944	1,491	2,330,404	—	1,426,492	347,833
July	421	44,814	—	258,879	90,777	125,800	2,900,967	10,778	18,193	18,375	305	557,414	—	3,926,084	365,802
August	—	65,132	6,975	775,312	65,243	212,629	979,239	3,858	6,305	—	—	549,637	—	2,527,321	829,857
September	—	47,398	8,800	779,456	11,550	287,630	595,184	11,451	19,669	—	1,707	147,030	—	3,375,199	632,332
October	2,355	6,472	1,900	739,640	133,129	704,861	258,965	29,397	3,498	—	—	97,385	—	243,799	528,912
November	130	20,589	1,300	431,457	97,116	420,306	73,905	103,466	46,178	—	9,245	597,819	203	406,334	698,978
December	120	1,930	3,575	522,231	335,695	621,371	87,565	123,782	8,512	—	14,928	237,947	13,129	555,076	335,834

TABLE 13. — *Fish on Hand in Cold Storage on the Fifteenth Day of the Month, from January 15, 1928, through December 15, 1928.*

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall and Silver Salmon (Pounds).	Salmon, all Others (Pounds).	Shad (Pounds).	Smelts, Eula- chon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish. (Pounds).
January	2,146	26,240	29,029	483,059	882,398	1,371,980	1,274,472	239,044	156,325	3,492	80,704	784,343	6,359	1,788,942	904,752
February	1,806	5,449	22,503	215,094	407,742	1,152,950	702,108	173,184	140,391	1,725	380,567	460,098	3,480	618,831	659,460
March	1,673	1,398	9,289	78,632	188,281	1,082,614	230,858	77,137	92,850	3,747	451,431	222,712	4,419	134,180	452,103
April	1,206	1,205	2,141	371,505	89,684	713,580	26,728	9,331	43,542	1,813	294,868	76,070	271	20,644	427,173
May	—	150	10,185	512,374	213,272	516,740	15,718	3,399	1,870	5,301	165,014	875,136	121	11,486	593,387
June	—	2,230	9,312	719,762	295,144	409,883	2,917,320	1,274	1,347	10,105	145,914	3,086,710	5	1,149,225	893,698
July	1,137	46,381	8,852	893,488	347,269	438,893	5,802,618	10,642	15,811	23,806	140,768	3,425,805	—	4,585,851	1,154,516
August	12,278	110,113	9,043	1,505,624	406,383	588,644	6,679,082	14,081	19,846	19,788	137,300	3,813,694	—	6,234,339	1,842,718
September	13,801	135,671	2,486	2,044,746	404,984	751,725	7,107,054	25,532	38,134	17,286	134,255	3,691,746	—	3,734,804	2,235,430
October	13,317	140,279	3,351	2,375,278	504,047	7,095,842	62,924	82,934	39,616	16,775	123,334	3,387,740	—	5,404,748	2,100,408
November	11,710	148,974	2,936	2,101,206	413,324	1,460,351	6,386,818	115,879	78,896	16,775	109,572	3,261,653	179	5,048,154	1,971,402
December	10,614	125,626	5,691	1,930,244	538,257	1,416,708	5,909,655	190,905	70,310	16,332	71,725	2,685,878	13,004	4,492,411	1,786,197

REPORT OF DIVISION OF COMMUNICABLE DISEASES.

CLARENCE L. SCAMMAN, M.D., *Director.*

FILIP C. FORSBECK, M.D., *Epidemiologist.*

General Statement.—The total cases of communicable diseases reported for 1928 was 103,573, an increase of 19,757 cases over the 1927 total, 83,816. The unusual prevalence of measles accounts for this increased incidence.

The advisory minimum quarantine requirements adopted in 1926 by the Massachusetts Association of Boards of Health and this Department have been accepted by approximately seventy-five cities and towns to date.

Because of two outbreaks of communicable disease in summer camps last year, one of diphtheria and the other of scarlet fever, a meeting of camp executives and local boards of health was called in November. At this meeting a committee was appointed made up of camp executives as well as health officers to study the general operation of summer camps, particularly from the point of view of medical supervision, sanitation and nutrition. It is hoped that this committee will formulate a set of minimum standards for the operation of summer camps, which will be acceptable to camp directors as well as local boards of health. There is at present no statute regulating the establishment and operation of summer camps in the State.

During the past two years there has been an outbreak of typhoid fever and one of diphtheria in two different general hospitals in the State. In both instances the preponderance of cases occurred in the nursing staff. The Department had supposed that it was a routine procedure on the part of hospital authorities to immunize at least their nursing staff against diphtheria, smallpox and typhoid fever. Immunizing material against these three diseases is manufactured by the Department and furnished free to Massachusetts citizens. Application of this protection to a nursing staff is so relatively simple that it is impossible to imagine why the nurses had not been immunized in the two instances cited.

The brief summary is given herewith of the morbidity, fatality and mortality of certain diseases:

Anterior Poliomyelitis (Table II).—This disease was reported in 434 instances, giving a morbidity rate of 10.0 per 100,000 population; 110 cases occurred in a localized outbreak in Waltham and Watertown, the morbidity rate based on the population of the two communities being 169.0 per 100,000 population. Athol, Orange and Walpole had localized outbreaks of the disease with morbidity rates of 116.0, 180.5 and 111.7 per 100,000, respectively. The Department, in cooperation with the Harvard Infantile Paralysis Commission, continued to furnish special consultative service to physicians. Elsewhere in this report is published a summary of Anterior Poliomyelitis in Massachusetts¹ from 1907 through 1928 by Drs. Luther and Forsbeck of this Department.

Diphtheria (Table III).—Commencing in May, the incidence of diphtheria for the State showed a decided falling off as compared with 1927. This lowered incidence continued through the remainder of the year. The number of cases (4,052) for 1928 is about midway between the number reported in 1927 (4,750) and the record low number (3,401) occurring in 1926. The peak of the 1927–1928 incidence curve occurred the week ending December 3, 1927, with 169 cases. The peak of the 1928–1929 curve occurred the week ending December 15 with 123 cases. The morbidity rate, 93.7 is the second lowest in the history of the Department. The fatality rate is 6.1.

Of the 268 diphtheria deaths which occurred in 1927, 117 were studied² intensively. Apparently, in certain cases, because of greater insidiousness of onset or heightened virulence of the strain of the organism, a fatal outcome is inevitable. Despite the reasonably early recognition of the disease and the prompt adminis-

¹ This study will be published in its entirety in the New England Journal of Medicine.

² Lane, E. A., Diphtheria Deaths in Massachusetts, 1927. Third Chronological Report, New England Journal of Medicine, Nov. 8, 1928.

tration of antitoxin, the patient would die within a day or two and not more than two or three days from the evident onset. The laboratory report was negative in one-quarter of the cases for which this service was provided. The most frequent cause of death appeared to be the failure of the parents to call a physician at the beginning of the illness. The death rate, 5.8, is the lowest in the history of the Department.

A statewide survey was made of toxin-antitoxin administration from the time when it was first employed in the Commonwealth on a community basis (Leominster, 1920) to January 1st, 1928. During this seven-year interval, 236,524 completed toxin-antitoxin treatments (three injections) were reported. Of 17,375 re-Schick tests performed during the same interval, 13 per cent were positive. In 1927 the number of cities and towns reporting toxin-antitoxin programs was 116, which is 33 per cent of the total number of cities and towns in the Commonwealth. These programs were in many instances very limited in conception and meagre in results.

Malaria. — The disease was reported 16 times with 6 deaths. At least four of the individuals received their infection outside the State. In one-half of the balance of the cases there was doubt as to the accuracy of the diagnosis. Because of the increased use of "therapeutic malaria" in the treatment of cerebrospinal syphilis, the Department circularized State and private institutions caring for this type of case, requesting that it be reported to local boards of health as "therapeutic" malaria; all other cases to be reported as "clinical" malaria.

Rabies. — Dog bite requiring anti-rabic treatment was made reportable in 1914. 378 cases of this condition were reported in 1927, the greatest number for any year since 1914.

Rabies among dogs continued to be epidemic, especially in the eastern part of the State during 1928, and by the end of August, 394 cases of dog bite requiring anti-rabic treatment had been reported. On September 19, 1928, the Department declared all dog bites dangerous to the public health and therefore reportable. This change in method of reporting was made because two of the four human deaths which occurred in 1928 followed dog bites which were never reported. The total number of dog bites for 1928 reported to the Department was 1,462.

Scarlet Fever (Table VI). — This year 10,473 cases of scarlet fever were reported. The fatality rate, .85, is the lowest since the disease was made reportable in 1884. The mortality rate, 2.1, is the lowest since 1918. The mortality rate from this disease in 1870 was 46.9. If the same mortality rate from this disease had occurred in 1928, 2,028 persons would have died of scarlet fever. The actual number of deaths in 1928 was 90.

Elsewhere in this report appears a summary of a paper by Dr. Carl R. Doering, Consulting Statistician to the Department, on Scarlet Fever in Massachusetts¹ since 1842.

Septic Sore Throat. — This year 500 cases were reported with 65 deaths. An outbreak occurred in Lee in July, with an approximate total of 1,000 cases and 48 deaths. Of the 500 cases of septic sore throat reported for the year but 209 were actually reported from Lee and the towns immediately adjacent thereto. This is the fourth devastating outbreak of this disease since 1907. The first occurred in Boston, Brookline and Cambridge in 1911, with a total of about 1,200 cases and 48 deaths; the second in Wakefield, Stoneham in 1914 with approximately 1,000 cases; the third in Boston and Milton in 1915, with approximately 311 cases and 2 deaths, and the fourth this year in Lee, as detailed above. Septic sore throat was made reportable in 1914. Since 1907 the Department has record of a total of eighteen outbreaks of this disease. The fifteen minor outbreaks varied from as few as 6 cases per outbreak to as many as 150 cases.

Smallpox. — This year 19 cases of smallpox were reported, the largest number since 1921, when 37 cases were reported. 15 of the 1928 cases were never successfully vaccinated and the balance, 4, had been vaccinated more than seven years preceding their attack. None of the 19 cases occurred in children of school age;

¹ This will be published in its entirety in one of the medical journals.

16 of the cases either received their infections or were contacts with an individual infected outside the State. The source of infection in 3 cases was undetermined.

Typhoid Fever. — A new low record was established this year for the number of cases reported, namely, 310, and 36 deaths, giving a mortality rate of .8, which is the lowest ever recorded in the State. At the present time the Department has record of 55 carriers; 7 were discovered during the present year.

Chapter 229 of the Acts of 1928 gives the local boards of health and this Department power to order the examination of a person engaged in the handling of food to ascertain whether or not he is afflicted with contagious, infectious or other disease, and whether or not in the opinion of the Department he is a carrier, so-called, of such disease. Such examination may include the taking of samples of body fluids. Authority is given under this legislation to local boards or this Department by which food handlers found to be carriers may be forced out of food handling occupations.

OUTBREAKS DURING 1928.

1. *January.* — Springfield outbreak of trichinosis. Nine cases and three deaths.
2. *January.* — Brookline outbreak of acute gastro-intestinal upset due to fish. About twenty cases and no deaths.
3. *March.* — Tewksbury (State Infirmary) outbreak of gastro-enteritis. Sixty-three cases and one death.
4. *April.* — North Reading (Tuberculosis Sanatorium) outbreak of tonsillitis, sinusitis, otitis media, broncho-pneumonia, etc. These different types of infection were occurring simultaneously. The factor was not determined. One hundred seventy-six cases and no deaths.
5. *May.* — Boston outbreak of smallpox. Four cases among closely associated negroes, with no deaths.
6. *May.* — Waltham outbreak of acute gastro-intestinal upset. About one hundred cases and no deaths.
7. *June.* — Chicopee-Springfield outbreak of typhoid fever traced to chicken salad served at a wedding breakfast and infected by a carrier. Twenty-eight cases and one death.
8. *June.* — Lee outbreak of septic sore throat traced to milk probably infected by a case. About one thousand cases and forty-eight deaths.
9. *July.* — Pembroke-Marshfield outbreak of scarlet fever traced to milk, probably infected by a case. Fifteen cases and no deaths.
10. *July.* — Quincy outbreak of acute gastro-intestinal upset of unknown source and mode. At least four cases with no deaths.
11. *July.* — Somerville-Boston outbreak of acute gastro-intestinal upset traced to chocolate pie. About one hundred fifty-one cases and no deaths.
12. *July.* — Waltham-Watertown outbreak of anterior poliomyelitis. Ninety cases and eight deaths.
13. *July-August.* — Medway outbreak of typhoid fever traced to milk, source unknown. Five cases and no deaths.
14. *August.* — East Brookfield outbreak of scarlet fever in a Y. M. C. A. camp traced to a case. About sixteen cases with no deaths.
15. *August.* — Fitchburg outbreak of impetigo in a hospital. About fifteen cases.
16. *August.* — Gloucester outbreak of impetigo in a hospital. About fifteen cases.
17. *August.* — Littleton outbreak of acute gastro-intestinal upset traced to milk. About twenty cases with no deaths.
18. *August.* — Sharon outbreak of diphtheria in Salvation Army Fresh Air Camp traced to a case. Seven cases and one death.
19. *August-September.* — Orange-Athol outbreak of anterior poliomyelitis. Twenty cases and three deaths.
20. *August-September.* — Worcester (State Hospital) outbreak of dysentery, traced to milk. About one hundred twenty-six cases and seventeen deaths.
21. *September.* — Dracut outbreak of diphtheria. Five cases and two deaths.

22. *September*. — Cambridge outbreak of acute gastro-intestinal upset traced to a spaghetti house. Three cases and no deaths.

23. *September*. — Greenfield outbreak of diphtheria. Twenty-three cases and no deaths.

24. *September–October*. — Walpole outbreak of anterior poliomyelitis. Eight cases and no deaths.

25. *November*. — Boston outbreak of acute gastro-intestinal upset traced to eclairs. Four cases and no deaths.

26. *November–December*. — Lynn outbreak of diphtheria principally among nurses in a hospital. Twenty-five cases and no deaths.

27. *November–December*. — North Reading (Tuberculosis Sanatorium) outbreak of scarlet fever. About thirty cases and one death.

28. *December–January*. — Gardner outbreak of smallpox. Nineteen cases and no deaths.

DISTRICT HEALTH OFFICERS.

The activities of the six District Health Officers during the past year, in addition to those required by statute, such as inspection of jails, lock-ups, hospitals, etc., have been as follows: routine visits to local boards of health, investigations of outbreaks of communicable disease, assistance in the furthering of the ten-year tuberculosis program and in the establishment of cancer clinics in their respective districts. In addition, they have continued to foster immunization programs against diphtheria and several large cities have undertaken such work during the year. More and more communities are assuming responsibility for diphtheria immunization but its effectiveness is measured by the interest and enthusiasm of the local boards of health. The majority of cases and deaths from diphtheria occur in the pre-school age group and no effective program has been devised to reach this, — the group which obviously needs protection more than any other in the community.

During the year just past, the District Health Officers have surveyed several communities, using either the rural or city appraisal form developed by the American Public Health Association. While there is nothing new about surveys, presentation of the results of the survey to public meetings with the recommendations to the local boards of health, has proven of great advantage in stimulating community interest in public health. There are 281 cities and towns with a population under 10,000 in the State. It is planned to develop an appraisal form based on the public health needs of this type of community. Intensive application of this means of measuring present community public health activities should result in less antiquated methods of local public health administration.

In addition to the routine visits made by the District Health Officers, the Division office staff made special visits to seventy-one different communities in connection with problems in the control of communicable disease either from the epidemiological or administrative point of view.

The District Health Officers were called in on consultation one hundred eighty times by physicians in their districts.

More than 16,000 people were reached through lectures by the personnel of the Division.

VENEREAL DISEASE.

Dr. N. A. Nelson entered the service on May 1st as Epidemiologist in charge of Venereal Disease Control. Although the actual incidence of these diseases is not indicated by their reported incidence, they are said to be as common as the "common cold." The presence then of a full time epidemiologist devoting all his time to this important phase of public health is worth mention.

This year 4,506 cases of gonorrhea were reported, giving a case rate of 104.2 per 100,000; 1,569 cases of syphilis were reported giving a case rate of 36.3 per 100,000. Both these diseases are reportable only if in a communicable stage. Although the case rates quoted above indicate an apparent increase in the reporting of gonorrhea and an apparent decrease in the reporting of syphilis, no one believes that these figures indicate the actual prevalence of the two diseases in the State.

Tables XII, XIII and XIV give certain statistical information in regard to these diseases. It must be remembered that under the International Classification of Causes of Death, deaths from "syphilis" do not include those from general paralysis of the insane nor *tabes dorsalis*, both of which are due to syphilis. The deaths from syphilis, including those from general paralysis of the insane and *tabes dorsalis*, numbered 414, giving a mortality rate of 9.59. The deaths from "syphilis" alone were 164, giving a mortality rate of 3.8.

There are 52 treatment centers in the State. Twenty-six of these are public clinics, of which 15 are subsidized by the Department. The remaining 26 centers are in the state hospitals and institutions, 3 of which have opened their out-patient departments to the public. During the year the 15 subsidized clinics admitted 4,560 new cases, treated an average of 4,800 patients per month and reported 174,714 visits by patients in the year. The new admissions numbered 1,100 less than in 1927 but the total visits to the clinics increased by 14,300. This would indicate that patients are taking treatment longer or more regularly. The 52 treatment centers admitted 6,088 new patients, treated an average of 6,025 patients per month and reported 280,377 visits.

As one of the major projects of the Department, an effort is being made to interest the medical profession in venereal disease to the end that they may think of the individual case in its relation to the public health. The first step has been to offer arsenicals free to all licensed physicians in the State. With the help of a medical advisory committee it is planned to formulate minimum standards for the treatment of syphilis. Demonstration clinics are contemplated. Printed information in regard to syphilis and gonorrhea to be given to the patient to supplement the doctor's advice will be available to all physicians.

The social worker and special investigator have investigated sources of infection, lapsed and delinquent cases in cooperation with local boards of health, community social agencies, courts, probation and parole officers and police officials. They have assisted in maintaining and improving social service standards in the clinics.

During 1928, about 32,000 pieces of printed information relative to venereal disease were distributed and talks were given to about 8,500 people by members of the venereal disease staff. The July-August-September number of the *Commonwealth* was devoted entirely to a discussion of venereal disease.

The Massachusetts Society for Social Hygiene has been reorganized and is now an active, growing, voluntary agency with a sound program. Dr. Helen I. McGillicuddy, Executive Secretary of the Society and part-time lecturer in this Department, with Dr. Nelson made a social hygiene survey of Holyoke, Massachusetts, in June, the salient points of which are being published in the *United States Public Health Service Bulletin of Venereal Disease Information*.

THE BACTERIOLOGICAL LABORATORY.

During the year ended December 31, 1928, the Bacteriological Laboratory examined 34,518 specimens, an increase of 1,093 over the number examined last year. The principal increases were in the number of films examined for gonococci and of special examinations, notably those for streptococci.

There is a growing demand for the examination of throat cultures for the organisms of Vincent's Angina and for hemolytic streptococci as well as for diphtheria bacilli. All swabs received for diagnosis for diphtheria are examined for fusiform bacilli and spirochetes. If the physician's diagnosis is septic sore throat, streptococcus sore throat or scarlet fever, examinations are made also for hemolytic streptococci.

Eighty-seven specimens of blood have been examined for evidence of undulant fever. One specimen agglutinated *Brucella abortus* in a dilution of 1:25 but in no higher dilution.

During July, when there was an outbreak of septic sore throat in the town of Lee, several hundred hemolytic streptococcus examinations were made of cultures from sick persons and from cows' milk. *Streptococcus epidemicus* was recovered from the throats of the patients and from the milk from one cow.

In July, following an outbreak of gastro-intestinal disturbance among the employees of three industrial concerns the laboratory received specimens of food and stools to be examined for organisms of the food poisoning group. Chocolate cream pie was the most suspicious food. Exhaustive studies of the bacteria found in the cream filling did not show the presence of any organisms of the *Salmonella* group. A colon bacillus, a staphylococcus and a streptococcus were found but none of these proved pathogenic for laboratory animals. No food poisoning bacteria were found in the stool specimens. Accounts of both of these outbreaks are being reported in detail in one of the journals.

TABLE I. — *Laboratory Examinations.*

	Positive.	Negative.	Atypical.	Total.
Diphtheria (primary)	682	11,406	—	12,088
Diphtheria (secondary)	1,430	2,948	—	4,378
Tuberculosis (sputum)	883	3,583	—	4,466
Typhoid fever (Widal)	156	1,584	35	1,775
Typhoid fever (culture)	46	2,176	—	2,222
Malaria	1	55	—	56
Gonorrhea	1,250	5,164	—	6,414
Miscellaneous	—	—	—	2,605
Pneumococcus Type Determination:				
Type I			(11.4) 37	
Type II			(8.6) 28	
Type III			(19.7) 64	
Group IV			(60.3) 196	
No pneumococci			189	514
Total				34,518

TABLE II. — *Anterior Poliomyelitis.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1919-23 (av.)	287	7.3	55	1.4	19.2
1924	277	6.8	27	.7	9.7
1925	167	4.0	52	1.3	31.1
1926	245	5.8	44	1.0	18.0
1927	1,189	27.8	169	4.0	14.2
1928	434	10.0	65	1.5	15.0

TABLE III. — *Diphtheria.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
(1919-23 (av.)	8,477	215.0	595	15.1	7.0
1924	7,290	177.7	534	13.0	7.3
1925	4,482	107.8	333	8.0	7.4
1926	3,401	80.7	249	5.9	7.3
1927	4,750	111.3	268	6.3	5.6
1928	4,052	93.7	249	5.8	6.1

TABLE IV. — *Lobar Pneumonia.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1919-23 (av.)	4,835	122.8	2,387	60.7	49.4
1924	4,552	111.0	1,944	47.4	42.7
1925	5,544	133.3	2,364	56.9	42.6
1926	5,134	121.8	2,409	57.2	46.9
1927	4,279	100.2	1,969	46.1	46.0
1928	4,785	110.6	2,163	50.0	45.2

TABLE V. — *Measles.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent.).
1919-23 (av.)	22,019	557.7	250	6.3	1.1
1924	22,425	546.6	165	4.0	.7
1925	28,816	693.0	337	8.1	1.2
1926	30,020	712.4	367	8.7	1.2
1927	13,498	316.2	87	2.0	.6
1928	41,519	960.0	265	6.1	.6

TABLE VI. — *Scarlet Fever.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent.).
1919-23 (av.)	9,355	237.2	166	4.2	1.8
1924	14,410	351.2	158	3.9	1.1
1925	10,319	248.2	117	2.8	1.1
1926	11,323	268.7	117	2.8	1.0
1927	16,546	387.6	144	3.4	.9
1928	10,473	242.2	90	2.1	.9

TABLE VII. — *Smallpox.*

YEAR.	Cases.	Deaths.
1919-23 (av.)	23	1
1924	12	2
1925	3	—
1926	4	—
1927	2	—
1928	19	—

TABLE VIII. — *Tuberculosis, Pulmonary.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent.).
1919-23 (av.)	6,151	156.5	3,494	88.9	56.8
1924	5,376	131.0	2,953	72.0	54.9
1925	5,385	129.5	2,883	69.3	53.5
1926	5,444	129.2	2,961	70.3	54.4
1927	5,049	118.3	2,774	65.0	54.9
1928	4,873	112.7	2,690	62.2	55.2

TABLE IX. — *Tuberculosis, Non-Pulmonary.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent.).
1919-23 (av.)	806	20.4	608	15.4	75.4
1924	893	21.8	577	14.1	64.6
1925	825	19.8	576	13.9	69.8
1926	874	20.7	555	13.2	63.5
1927	807	18.9	429	10.0	53.2
1928	757	17.5	433	10.0	57.2

TABLE X. — *Typhoid Fever.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent.).
1919-23 (av.)	821	20.9	95	2.4	11.6
1924	566	13.8	68	1.7	12.0
1925	592	14.2	73	1.8	12.3
1926	547	13.0	61	1.4	11.1
1927	466	10.9	44	1.0	9.4
1928	310	7.2	36	.8	11.6

TABLE XI. — *Whooping Cough.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1919-23 (av.)	7,771	196.9	371	9.4	4.7
1924	4,062	99.0	147	3.6	3.6
1925	8,077	194.2	269	6.5	3.3
1926	11,547	274.0	391	9.3	3.4
1927	6,273	146.9	149	3.5	2.4
1928	8,023	185.5	208	4.8	2.6

TABLE XII. — *Gonorrhea and Syphilis.*

YEAR.	GONORRHEA.		SYPHILIS.				
	Cases.	Case Rate per 100,000.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1919-23 (av.)	6,416	163.7	2,687	68.6	222	5.7	8.3
1924	5,241	127.7	2,325	56.7	176	4.3	7.6
1925	5,192	124.9	2,147	51.6	148	3.6	6.9
1926	4,920	116.8	1,904	45.1	165	3.9	8.7
1927	4,294	100.6	1,666	39.0	135	3.2	8.1
1928	4,506	104.2	1,569	36.3	164	3.8	10.5

TABLE XIII. — *Deaths from General Paralysis of the Insane, and First Admissions to State Institutions for Mental Diseases for General Paralysis of the Insane.*

YEAR.	Deaths.	Death Rate per 100,000.	First Admissions.	Rate per 100,000.
1919-23 (av.)	210	5.3	242	6.1
1924	223	5.4	258	6.3
1925	229	5.5	249	6.0
1926	230	5.5	232	5.5
1927	198	4.6	190	4.5
1928	204	4.7	202	4.7

TABLE XIV. — *Grams¹ of Arsphenamine, Sulpharsphenamine, Nearsphenamine and Bichloridol Distributed.*

YEAR.	Arsphenamine.	Sulph- arsphenamine.	Neo- arsphenamine.	Bichloridol.
1924	27,603	18,864	—	13,412
1925	26,121	27,911	—	17,043
1926	21,726	31,895	—	9,486
1927	23,350	28,716	—	15,900
1928	8,313	16,619	13,134	14,585

ANTERIOR POLIOMYELITIS IN MASSACHUSETTS, 1907-1928.

ELIOT H. LUTHER, M.D.

FILIP C. FORSBECK, M.D.

During the past year diagnostic aid has been rendered to physicians of the State in cases of poliomyelitis. In addition, the records at the State Health Department for the past twenty years have been gone over and tabulated with reference to epidemic years, seasonal incidence, relation of the morbidity and mortality rates to the size of the community, and the age distribution of the disease by years, and its relation to the density of the population.

Furthermore, intensive studies were made of an outbreak in an outlying section of Haverhill in 1927 and a similar study was made of a section of Waltham this year. This work throws some light on the possible numbers of abortive cases and their relationship to the spread of the disease. A study has also been made of all cases where contact with a preceding case could be established which occurred

¹ Based on gram units.

in the State this year. This indicates that the disease may, in certain instances, spread directly from person to person and that the incubation period of the disease varies from six to as long as twenty days in some cases.

A study of the relationship of tonsillectomy to poliomyelitis in the 1927 outbreak suggests that in certain rather rare cases the patient was carrying the virus of the disease in the nasopharynx at the time of operation. The operation made possible the actual invasion of the patient by the virus of the disease. This assumption is based on the fact that the interval elapsing between tonsillectomy and onset of the disease corresponded to the incubation period of the disease. A full report of these cases will appear in an early issue of the *New England Journal of Medicine* by W. Lloyd Aycock and Eliot H. Luther.

In conjunction with the Harvard Infantile Paralysis Commission, a study of the early diagnosis of the disease and the use of convalescent serum during the 1927 outbreak has been completed. The report of this work is in the *Journal of the American Medical Association*, August 11, 1928, under the title "Preparalytic Poliomyelitis. Observations in One Hundred and Six Cases in which Convalescent Serum was Used," by W. Lloyd Aycock and Eliot H. Luther. The data presented would seem to indicate a beneficial effect of serum. This year the observations have been continued and about 120 cases have been seen and treated. A full report of this will appear later in one of the journals.

SCARLET FEVER IN MASSACHUSETTS, 1842-1928.

CARL R. DOERING, M.D.

1. In 1928 in Massachusetts the mortality from scarlet fever was 2.1 per 100,000 population. Since about 1870, it decreased in this State almost geometrically. Prior to that time, that is from 1842 to 1870, it appears to have remained stationary, fluctuating around the mean rate of about 80 per 100,000.

2. In the Ten Original Registration States of 1900 the mortality from this disease has also decreased, although there are some differences in the amount of decrease when the states are considered separately. New York, New Jersey, Rhode Island, Connecticut and Massachusetts show the largest mortality decreases while Maine, New Hampshire, Indiana and Michigan show lesser amounts of decrease. In Vermont from 1903 the mortality rate appears to have increased. From the above it would seem that the states with the largest decrease in mortality rates are more urbanized than those with lesser amounts of decrease. That the decrease in thickly settled places should be greater than in rural places might be explained by the greater opportunity for infection and the resulting acquired immunity in the former places.

3. When the mortality rates are plotted and trend lines drawn, the variations about the trend lines seem to be associated in their magnitude with the magnitude of the rates of decrease. In other words, the states with the largest rates of decrease show the greatest annual fluctuations in mortality rates. The highest rate of decrease was in New York with a rate of 8.4 per cent per annum. In Massachusetts the rate was 5 per cent per annum. The lowest rate of decrease was in New Hampshire and Maine and was practically 0. The highest rate of increase was in Vermont from 1903 with a rate of 4 per cent per annum. The states with the highest rates of decrease also had the highest mean rates over the period covered, so that it appears that epidemic conditions, as measured by annual fluctuations, are more likely to occur in those states which have had high rates and are by and large more urban than the remaining states. Likewise rural states with low mean rates tend to a more endemic form of the disease.

4. When the trends of some of the states are compared it is noticed by inspection that there seems to be correlation in their annual fluctuations from their respective trend lines. A year that is high in one state is apt to be high in the other states. This is most noticeable in the three states New Jersey, New York and Connecticut, but when each of the states is correlated with the remaining nine there seem to be no rational relations between them. None of the New England States is consistently positively correlated with all of the others. Rhode Island is consistently

negatively correlated with all the other states except Indiana. For the states between which there is a great deal of communication such as Massachusetts, New York, New Jersey and Connecticut there exists a fair degree of correlation but in view of the large inconsistencies in the other states it is not thought to be significant.

5. In the thirty-four Registration States of 1920 the mortality rates are negatively correlated with the percentages of rural populations. From this it would seem that the more urbanized a state is the greater is its scarlet fever mortality rate. This, however, may not be true and the above correlation may be due to the southern states since the southern states have mortality rates from scarlet fever which are significantly less than the rates in the northern states and are by and large more rural than the northern states. When the same correlation is found for the northern and southern states separately, we find that this relation between the low mortality rates and high percentage of rural population exists only in the South.

6. The northern states show a significantly higher mortality than the southern states.

7. There seems to be no difference among the states with respect to altitude.

8. In the thirty-four Registration States of 1920 scarlet fever seems to be correlated significantly with erysipelas and puerperal septicaemia, and also with pneumonia.

9. The trend of puerperal septicaemia and of erysipelas in Massachusetts has not shown as great a decrease in mortality as that of scarlet fever. While the mortality of scarlet fever has declined, the morbidity of the disease has not declined, showing that the streptococcus of this disease as well as the streptococci of the diseases just mentioned are about as prevalent now as formerly.

10. The case fatality of scarlet fever in the State has declined. Theoretically, at least, this may be due to a change in virulence in the organism or to a change in the susceptibility of the host.

11. The mortality rate varies considerably more than the morbidity rate with the size of the town. The case fatality rate varies positively from the small to the larger places. The disease is more virulent in the larger cities. This may be due in part, at least, to the fact that the serious cases in the smaller places are sent to hospitals and die in the larger places.

12. Although the case fatality and virulence of the disease has decreased in many places, as in Massachusetts, it cannot be said in general for the disease. Since 1902 in the State of Vermont, the case fatality has remained practically constant, while the case rate shows an increase. The trend in the death rate as noted before was slightly upward. The case fatality in Vermont at the present time averages about 2 per cent or slightly more, while that in Massachusetts averages about 1 per cent. For the eight years including and preceding 1926, the average case fatality of Vermont was 2.24; the eight years including and preceding 1909 the average was 2.57.

13. Although there seems to be no great change in the relation between mortality and age during the last fifty years, the group 0-4 shows somewhat less mortality in proportion to the group 5-9 at the present time than it did in 1850.

14. There are notable differences in the seasonal distribution of the disease between the southern states, namely, those with low incidence, and Massachusetts. In the South the mortality is greater in the fall months and in Massachusetts is greater in the late winter and spring months. Since the southern states show a peak of mortality for malaria in the fall months it may be possible that the infestation of the population with the malaria parasite may act upon its resistance to scarlet fever perhaps in a manner not dissimilar to that in which cold weather and the accompanying gripes and colds may increase the chance of mortality in the North.

15. The case fatality for Boston since 1877 has declined at the rate of 3.6 per cent per annum. The morbidity rate has practically remained the same, therefore the mortality has declined at about the same percentage. Compared with the State as a whole (5 per cent) Boston shows a lesser rate of decrease.

16. In most places in this country the disease has decreased in virulence, although in some foreign countries this is not so. It is possible that the decline in virulence has been affected to some extent by public health measures, principally isolation and quarantine. Doubtless there are other and more potent factors at work causing this decline. From the published statistics, it is not possible to identify and evaluate these suspected factors.

Scarlet Fever Cases by Age and Sex, 1921-1928.

YEAR.	0-4.		5-9.		10-14.		15-19.		20-29.		30-39.		40-49.		50 AND OVER.		UNKNOWN.			Total
																	M.	F.	U.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.				
1921	8,331
1922	7,868
1923	12,300
1924	14,410
1925	10,319
1926	11,323
1927	16,546
1928	10,473

Scarlet Fever Deaths, 1906-28, by Months.

YEARS.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1906	17	10	17	9	23	16	8	3	2	6	13	11	135
1907	27	44	37	21	22	26	21	12	8	14	16	37	285
1908	49	43	53	44	48	35	20	14	9	7	22	25	369
1909	39	22	34	26	27	28	17	13	6	17	12	18	259
1910	14	30	39	33	42	23	18	12	7	8	8	20	254
1911	26	28	31	18	17	10	8	6	12	4	11	13	184
1912	9	17	14	12	11	3	4	2	4	8	9	25	118
1913	43	35	31	45	25	25	14	18	7	11	17	22	293
1914	36	35	40	25	22	21	19	5	4	12	12	15	246
1915	18	24	29	25	38	14	8	5	4	1	6	10	182
1916	17	20	15	16	20	14	3	3	4	3	4	8	127
1917	9	18	13	18	11	11	5	4	2	5	8	16	120
1918	14	7	10	10	4	6	3	3	4	5	5	5	78
1919	11	7	13	14	8	6	7	7	4	9	13	23	122
1920	21	37	23	27	21	13	8	9	7	9	19	20	214
1921	26	18	33	25	16	13	7	7	7	16	14	9	191
1922	18	26	17	15	15	11	5	11	5	6	7	13	149
1923	14	23	28	28	11	11	9	3	2	8	5	13	155
1924	19	16	25	23	15	11	9	5	5	5	12	13	158
1925	19	24	14	13	11	6	4	-	4	6	6	10	117
1926	11	9	14	14	11	15	10	7	4	4	9	9	117
1927	14	28	18	13	16	12	6	9	4	7	9	8	144
1928	12	10	11	13	8	9	3	5	-	2	6	11	90

Scarlet Fever Deaths by Age and Sex, 1921-1928.

YEAR.	0-4.		5-9.		10-14.		15-19.		20-29.		30-39.		40-49.		50 AND OVER.		Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
1921	53	40	25	37	5	5	2	8	1	6	1	1	3	1	3	-	191
1922	38	40	20	15	4	7	1	2	3	8	4	4	1	1	1	-	149
1923	37	33	14	19	6	9	5	3	5	8	1	10	-	2	-	3	155
1924	46	39	21	16	3	5	4	5	2	10	2	3	-	-	1	1	158
1925	32	26	9	10	8	7	4	1	7	7	2	1	1	-	1	1	117
1926	34	22	21	18	2	2	1	1	2	6	2	2	1	3	-	-	117
1927	35	24	17	24	7	7	2	4	3	8	2	5	2	3	1	-	144
1928	24	18	8	10	2	7	1	2	3	6	3	3	2	-	1	-	90

Scarlet Fever Cases, 1906-28, by Months.

YEARS.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1906	592	418	534	490	570	454	249	182	240	455	459	580	5,223
1907	1,495	949	887	725	513	542	340	293	403	489	644	651	7,931
1908	739	912	979	795	842	447	237	331	409	662	829	812	7,994
1909	964	680	793	670	639	555	348	308	427	582	589	669	7,224
1910	881	698	733	1,367	1,211	607	344	257	327	447	477	533	7,882
1911	701	671	762	670	660	417	238	207	297	474	524	552	6,173
1912	653	569	586	504	421	254	174	169	229	447	577	1,050	5,633
1913	961	943	1,023	812	721	520	248	196	268	503	747	1,120	8,062
1914	1,444	1,432	1,717	1,464	1,422	770	383	226	307	517	620	755	11,057
1915	858	836	932	1,072	1,129	885	400	274	299	439	644	845	8,613
1916	948	772	879	696	703	433	218	154	201	305	376	586	6,271
1917	672	597	721	652	567	412	241	145	248	440	587	671	5,953
1918	609	537	540	626	487	287	200	122	177	225	287	393	4,490
1919	563	562	719	715	810	492	268	248	407	788	1,054	1,392	8,018
1920	1,714	1,079	1,223	1,358	1,216	715	337	213	287	543	658	917	10,260
1921	1,135	1,192	1,258	1,013	649	492	251	231	279	431	661	739	8,331
1922	920	944	996	736	755	470	226	208	281	554	807	971	7,868
1923	1,215	1,300	1,566	1,419	1,470	1,054	437	282	312	677	1,018	1,550	12,300
1924	2,082	2,076	2,100	1,719	1,447	911	381	237	367	742	937	1,411	14,410
1925	1,684	1,462	1,458	1,148	996	563	269	179	225	566	781	988	10,319
1926	1,289	1,119	1,194	1,103	956	927	628	295	353	729	1,191	1,539	11,323
1927	2,150	2,129	2,517	2,015	1,811	1,587	643	349	432	728	968	1,217	16,546
1928	1,508	1,400	1,407	1,126	1,049	788	317	225	314	532	770	1,037	10,473

Scarlet Fever Deaths and Death Rates 1842-1928.

YEAR.	Deaths.	Death Rate per 100,000.	YEAR.	Deaths.	Death Rate per 100,000.
1842	699	88.3	1887	594	28.9
1843	420	51.4	1888	504	23.8
1844	386	45.8	1889	185	8.5
1845	604	69.5	1890	196	8.8
1846	476	53.2	1891	246	10.7
1847	240	26.1	1892	669	28.6
1848	264	27.9	1893	810	33.9
1849	1,143	117.7	1894	649	26.5
1850	441	44.3	1895	483	19.3
1851	389	38.1	1896	249	9.8
1852	843	80.6	1897	342	13.1
1853	1,005	94.1	1898	141	5.3
1854	490	44.8	1899	235	8.6
1855	347	31.1	1900	330	11.8
1856	1,252	110.0	1901	385	13.5
1857	2,013	173.2	1902	313	10.8
1858	1,033	87.1	1903	510	17.4
1859	1,006	83.2	1904	138	4.7
1860	916	74.3	1905	117	3.9
1861	1,137	91.8	1906	135	4.4
1862	1,261	101.3	1907	285	9.0
1863	1,399	111.7	1908	369	11.4
1864	1,503	119.3	1909	259	7.8
1865	807	63.7	1910	254	7.5
1866	385	29.6	1911	184	5.3
1867	828	62.0	1912	118	3.4
1868	1,369	99.3	1913	293	8.2
1869	1,405	99.2	1914	246	6.8
1870	683	46.9	1915	182	4.9
1871	867	58.0	1916	127	3.4
1872	1,377	89.7	1917	120	3.2
1873	1,472	93.7	1918	78	2.1
1874	1,382	85.8	1919	122	3.2
1875	1,684	101.9	1920	214	5.5
1876	1,222	73.0	1921	191	4.9
1877	467	27.4	1922	149	3.7
1878	404	23.4	1923	155	3.8
1879	850	48.4	1924	158	3.9
1880	574	32.1	1925	117	2.8
1881	397	21.9	1926	117	2.8
1882	318	17.2	1927	144	3.4
1883	575	30.6	1928	90	2.1
1884	627	32.9			
1885	587	30.2			
1886	331	16.6			

Cases and Deaths from Certain Communicable Diseases in Massachusetts from 1923 through 1927.

Year	1923.		1924.		1925.		1926.		1927.	
Population	4,046,923		4,102,513		4,158,103		4,213,693		4,269,283	
DISEASE.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Actinomycosis	6	4	4	2	3	1	2	1	3	3
Anterior Poliomyelitis	223	35	277	27	167	52	245	44	1,189	169
Anthrax	7	2	11	2	5	1	13	1	5	—
Chicken Pox	7,983	11	8,985	9	7,516	9	8,284	7	9,927	8
Dog Bite	252	—	208	—	186	—	169	—	378	—
Dysentery	3	2	25	3	13	5	8	3	14	7
Encephalitis Lethargica	180	85	106	58	146	99	105	78	79	61
Epidemic Cerebrospinal Meningitis	121	41	128	39	112	35	116	39	75	43
German Measles	527	—	1,644	3	6,778	3	6,236	4	646	1
Influenza	2,466	742	405	277	1,244	519	2,193	718	515	326
Malaria	23	3	36	2	11	6	22	1	9	1
Mumps	7,707	6	9,431	12	2,674	6	5,117	2	10,752	6
Ophthalmia Neonatorum	1,480	—	1,820	—	1,988	—	1,832	—	1,827	—
Pellagra	16	11	18	12	19	10	16	11	15	10
Septic Sore Throat	197	27	170	47	116	29	129	35	141	50
Tetanus	28	18	41	23	45	35	30	23	25	23
Trachoma	62	—	55	—	75	—	53	—	33	—
Trichinosis	13	—	40	1	26	—	13	—	—	1
Glanders	—	—	—	—	—	—	—	—	—	—
Hookworm	12	—	18	—	23	—	8	—	—	—
Leprosy	1	—	—	—	—	—	1	—	—	—
Rabies	3	1	1	1	2	3	—	—	2	2
Typhus Fever	1	—	—	—	2	—	—	—	—	—

Cases and Deaths, with Case and Death Rates per 100,000 Population¹ for all Reportable Diseases During the Year 1928.

DISEASE.	Cases.	Case Rate per 100,000 Population.	Deaths.	Death Rate per 100,000 Population.	Fatality Rate (Per Cent).
Actinomycosis	3	.1	3	.1	100.0
Anterior Poliomyelitis	434	10.0	65	1.5	15.0
Anthrax	8	.2	—	—	—
Chicken Pox	8,546	197.6	6	.1	.1
Diphtheria	4,052	93.7	249	5.8	6.1
Dog Bite	1,462	33.8	—	—	—
Dysentery	25	.6	15	.3	60.0
Encephalitis Lethargica	74	1.7	56	1.3	75.7
Epidemic Cerebrospinal Meningitis	107	2.5	38	.9	35.5
German Measles	672	15.5	—	—	—
Gonorrhea	4,506	104.2	9	.2	.2
Influenza	1,305	30.2	520	12.0	39.8
Malaria	16	.4	6	.1	37.5
Measles	41,519	960.0	265	6.1	.6
Mumps	7,215	166.8	7	.2	.1
Ophthalmia Neonatorum	1,630	37.7	—	—	—
Pellagra	20	.5	13	.3	65.0
Pneumonia, Lobar	4,785	110.6	2,163	50.0	45.2
Rabies	4	.1	4	.1	100.0
Scarlet Fever	10,473	242.2	90	2.1	.9
Septic Sore Throat	500	11.6	65	1.5	13.0
Smallpox	19	.4	—	—	—
Syphilis	1,569	36.3	164	3.8	10.5
Tetanus	28	.6	24	.6	85.7
Trachoma	51	1.2	—	—	—
Trichinosis	14	.3	4	.1	28.6
Tuberculosis, Pulmonary	4,873	112.7	2,690	62.2	55.2
Tuberculosis, Other Forms	757	17.5	433	10.0	57.2
Tuberculosis, Hilum	571	13.2	—	—	—
Typhoid Fever	310	7.2	36	.8	11.6
Whooping Cough	8,023	185.5	208	4.8	2.6
Hookworm	—	—	—	—	—
Leprosy	2	.04	—	—	—
Total	103,573	2,394.8	7,133	164.9	6.9

¹ Population, 1928, 4,324,873.

Cases and Deaths from Communicable Diseases by Months, 1928.

	JAN- UARY.		FEB- RUARY.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUGUST.		SEP- TEMBER.		OCTOBER.		NO- VEMBER.		DE- CEMBER.		TOTAL.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Actinomycesis	17	3	13	1	1	3	6	1	7	2	7	6	21	1	164	2	1	17	50	1	14	3	10	1	3	3
Anterior Poliomyelitis																										
Arthritis	1290	1	1092	1	1	1	646	1	554	1	568	1	290	1	81	2	97	421	935	2	935	2	1567	8	434	6
Chicken Pox	485	28	496	40	411	15	337	24	315	29	261	12	163	9	172	8	157	16	413	22	359	18	483	28	4052	249
Diphtheria	38		38		48		35		60		48		61		66		50		331		395		292		1482	
Dog Bite											2	1	2	3	1	8	9	4	3	3	3	12	1	1	1	25
Dysentery											7	6	5	3	5	2	8	6	7	4	5	3	7	7	74	56
Encephalitis Lethargica	2	1	9	7	1	4	6	4	7	9	7	6	5	3	5	2	8	6	7	4	5	3	12	1	74	56
Epidemic Cerebrospinal Meningitis	11	2	7	5	13	5	7	1	9	6	10	3	9	4	8	3	5		9	3	10	6	9		107	38
German Measles	104		110		111		73		81		53		25		10		17		21		30		37		672	
Gonorrhea	395		327		402		298		483	2	322	1	373	1	370		388	2	439		345	2	364	1	4506	9
Hookworm																										
Influenza	58	40	57	41	50	54	82	68	304	122	98	48	75	17	12	6	26	14	32	18	33	28	478	64	1305	520
Leprosy																										
Malaria																										
Measles	5518	17	7174	39	8236	45	6418	54	4252	37	2917	25	1351	8	325	3	3	1	796	5	1620	8	2754	1	41519	265
Mumps	1311	1	1325	2	1487	2	997	2	678	1	439	1	156		59		74		149	1	232		308		7215	7
Ophthalmia Neonatorum	162		151		143		191		114		109		157		124		124		114		107		134		1630	
Pellagra																										
Pellagra, Lobar	521	255	604	257	618	289	659	288	706	312	305	133	142	56	74	34	99	59	266	127	241	121	550	232	4785	2163
Pneumonia																										
Rabies																										
Scarlet Fever	1508	12	1400	10	1407	11	1126	13	1049	8	788	9	317	3	225	5	314	1	532	2	770	2	1037	11	10473	90
Septic Sore Throat																										
Smallpox	3		22	2	15	2	10	4	14	1	17	4	243	37	26	4	18	3	13	3	2	2	22	6	500	65
Syphilis	101	18	142	12	138	20	96	18	171	8	106	12	103	14	125	11	115	9	126	16	163	16	123	10	1599	164
Tetanus	3	2	2	1	1	1	2	2	1	3	5	4	4	4	1	1	8	6	2	2	5	1	2	1	28	24
Trachoma	3		8		7		8		3		4		1		3		4		3		5		2		51	
Trichinosis	9	2																							14	4
Tuberculosis, Pulmonary	372	238	415	224	435	256	431	212	475	292	434	230	451	218	379	206	324	208	419	197	367	204	371	205	4873	2690
Tuberculosis, Other																										
Forms	70	30	64	45	73	36	79	43	82	46	78	38	50	31	74	34	46	24	48	37	46	31	47	38	757	433
Tuberculosis, Hilum	25		23		87		87		30		76		26		15		45		23		110		37		571	
Typhoid Fever	27	4	15	2	13		10	3	14	1	34	2	7	5	44	4	42	3	39	4	30	4	14	4	310	36
Whooping Cough	1271	25	1079	26	1199	25	823	22	726	28	517	15	405	13	389	10	265	8	336	23	425	5	588	8	8023	208
Total	13487	683	14574	714	15877	769	12431	766	10145	906	7205	554	4471	425	2769	357	2507	387	4597	478	6262	458	9248	636	103573	7133

Index to Line Numbers in the Table of Cases and Deaths from Diseases Dangerous to the Public Health.

Abington	122	Dunstable	343	Lincoln	255
Acton	190	Duxbury	229	Littleton	252
Acushnet	138			Longmeadow	151
Adams	67	East Bridgewater	155	Lowell	11
Agawam	107	East Brookfield	289	Ludlow	85
Alford	355	East Longmeadow	153	Lunenburg	215
Amesbury	73	Eastham	319	Lynn	12
Amherst	119	Easthampton	74	Lynnfield	258
Andover	76	Easton	127		
Arlington	34	Edgartown	267	Malden	20
Ashburnham	205	Egremont	323	Manchester	191
Ashby	287	Enfield	303	Mansfield	111
Ashfield	288	Erving	260	Marblehead	90
Ashland	186	Essex	259	Marion	266
Athol	87	Everett	29	Marlborough	53
Attleboro	45			Marshfield	216
Auburn	126	Fairhaven	70	Mashpee	344
Avon	196	Fall River	8	Mattapoisett	233
Ayer	174	Falmouth	128	Maynard	95
		Fitchburg	28	Medfield	147
Barnstable	116	Florida	334	Medford	21
Barre	165	Foxborough	41	Medway	168
Becket	296	Frammingham	41	Melrose	44
Bedford	240	Franklin	100	Mendon	282
Belchertown	159	Freetown	232	Merrimac	198
Bellingham	162			Methuen	38
Belmont	51	Gardner	47	Middleborough	86
Berkley	272	Gay Head	359	Middlefield	358
Berlin	274	Georgetown	228	Middleton	219
Bernardston	293	Gill	290	Milford	59
Beverly	43	Gloucester	39	Millbury	109
Billerica	124	Goshen	349	Millis	218
Blackstone	133	Gosnold	360	Millville	199
Blandford	333	Grafton	108	Milton	62
Bolton	295	Granby	299	Monroe	362
Boston	3	Granville	312	Monson	131
Bourne	166	Great Barrington	115	Montague	98
Boxborough	341	Greenfield	60	Monterey	336
Boxford	313	Greenwich	325	Montgomery	356
Boylston	281	Groton	187	Mount Washington	366
Braintree	64	Groveland	202		
Brewster	298			Nahant	227
Bridgewater	81	Hadley	178	Nantucket	161
Brimfield	294	Halifax	309	Natick	65
Brocton	17	Hamilton	204	Needham	79
Brookfield	256	Hampden	310	New Ashford	365
Brookline	26	Hancock	317	New Bedford	10
Buckland	238	Hanover	180	New Braintree	330
Burlington	230	Hanson	203	New Marlborough	285
		Hardwick	173	New Salem	321
Cambridge	9	Harvard	311	Newbury	249
Canton	123	Harwich	206	Newburyport	58
Carlisle	316	Hatfield	185	Newton	19
Carver	244	Haverhill	25	Norfolk	269
Charlemont	300	Hawley	342	North Adams	42
Charlton	194	Heath	347	North Andover	102
Chatham	231	Hingham	114	North Attleborough	80
Chelmsford	105	Hinsdale	283	North Brookfield	164
Chelsea	24	Holbrook	163	North Reading	220
Cheshire	214	Holden	152	Northampton	36
Chester	237	Holland	361	Northborough	210
Chesterfield	327	Holliston	179	Northbridge	83
Chicopee	27	Holyoke	18	Northfield	226
Chilmark	351	Hopedale	160	Norton	176
Clarksburg	265	Hopkinton	184	Norwell	246
Clinton	63	Hubbardston	280	Norwood	61
Cohasset	171	Hudson	94		
Colrain	247	Hull	170	Oak Bluffs	254
Concord	99	Huntington	239	Oakham	314
Conway	292			Orange	136
Cummington	322	Ipswich	121	Orleans	279
		Kingston	189	Otis	332
Dalton	141			Oxford	144
Dana	304	Lakeville	257	Palmer	75
Danvers	72	Lancaster	183	Paxton	307
Dartmouth	78	Lanesborough	268	Peabody	46
Dedham	57	Lawrence	15	Pelham	320
Deerfield	172	Lee	146	Pembroke	245
Dennis	224	Leicester	140	Pepperell	177
Dighton	154	Lenox	175	Peru	364
Douglas	197	Leominster	40	Petersham	305
Dover	276	Leverett	308	Phillipston	335
Dracut	106	Lexington	92	Pittsfield	22
Dudley	132	Leyden	352	Plainfield	350

Plainville	241	South Hadley	101	Warwick	337
Plymouth	69	Southampton	286	Washington	353
Plympton	318	Southborough	208	Watertown	35
Prescott	354	Southbridge	56	Wayland	270
Princeton	297	Southwick	262	Webster	68
Provincetown	157	Spencer	110	Wellesley	77
Quincy	16	Springfield	7	Wellfleet	302
Randolph	120	Sterling	236	Wendell	331
Raynham	201	Stockbridge	228	Wenham	275
Reading	89	Stoneham	84	West Boylston	211
Rehoboth	193	Stoughton	93	West Bridgewater	169
Revere	33	Stow	271	West Brookfield	261
Richmond	306	Sturbridge	217	West Newbury	270
Rochester	278	Sudbury	243	West Springfield	55
Rockland	97	Sunderland	264	West Stockbridge	263
Rockport	148	Sutton	221	West Tisbury	345
Rowe	348	Swampscott	88	Westborough	112
Rowley	250	Swansea	150	Westfield	48
Royalston	301	Taunton	31	Westford	149
Russell	251	Templeton	139	Westhampton	340
Rutland	188	Tewksbury	130	Westminster	207
Salem	30	Tewksbury State Infirmary	367	Weston	167
Salisbury	223	Tisbury	248	Westport	137
Sandisfield	324	Tolland	363	Westwood	222
Sandwich	253	Topsfield	291	Weymouth	50
Saugus	66	Townsend	212	Whately	273
Savoy	339	Truro	326	Whitman	96
Scituate	182	Tyngsborough	277	Wilbraham	181
Seekonk	135	Tyringham	346	Williamsburg	213
Sharon	156	Upton	209	Williamstown	143
Sheffield	234	Uxbridge	113	Wilmington	145
Shelburne	242	Wakefield	52	Winchendon	117
Sherborn	315	Wales	329	Winchester	71
Shirley	195	Walpole	103	Windsor	338
Shrewsbury	104	Waltham	32	Winthrop	54
Shutesbury	357	Ware	91	Woburn	49
Somerset	125	Wareham	118	Worcester	5
Somerville	13	Warren	142	Worthington	328
				Wrentham	158
				Yarmouth	235

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation estimated as of July 1, 1928.	An- terior Poli- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Mening- itis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	Massachusetts	4,324,873	434	65	8546	6	4052	249	107	38	672	-	4506	9
2	CITIES OF OVER 500,000.													
3	Boston	799,155	58	15	2025	2	898	63	21	20	136	-	2417	5
4	CITIES OF OVER 150,000.													
5	Worcester	197,550	5	3	462	-	269	13	5	2	43	-	258	-
6	CITIES OF 100,000-150,000.	845,166	59	7	1261	2	1400	84	19	6	138	-	875	2
7	Springfield	149,721	6	2	339	-	348	29	6	3	27	-	217	2
8	Fall River	134,210	13	1	100	1	117	4	3	-	4	-	98	-
9	Cambridge	125,800	11	-	324	-	246	9	2	1	55	-	141	-
10	New Bedford	118,500	7	-	162	-	258	14	2	1	20	-	98	-
11	Lowell	108,775	6	1	54	1	116	14	3	-	2	-	188	-
12	Lynn	105,475	8	3	195	-	172	7	2	1	8	-	91	-
13	Somerville	102,675	8	-	87	-	143	7	1	-	22	-	42	-
14	CITIES OF 50,000-100,000.	500,381	56	16	1208	1	288	19	11	1	75	-	148	-
15	Lawrence	93,070	4	1	94	-	4	6	5	1	2	-	33	-
16	Quincy	67,575	1	2	189	-	20	1	2	-	7	-	12	-
17	Brockton	64,780	5	2	144	-	59	2	1	-	9	-	33	-
18	Holyoke	61,298	-	-	32	-	62	4	-	-	12	-	8	-
19	Newton	57,285	25	2	256	1	14	-	1	-	23	-	-	-
20	Malden	53,430	3	1	115	-	22	2	1	-	4	-	15	-
21	Medford	52,924	3	-	349	-	39	2	1	-	16	-	20	-
22	Pittsfield	50,019	15	8	29	-	31	2	-	-	2	-	27	-
23	CITIES AND TOWNS, 25,000-50,000.	514,560	146	13	871	-	358	15	21	5	73	-	381	2
24	Chelsea	49,740	1	-	27	-	18	-	5	-	1	-	26	-
25	Haverhill	46,353	1	-	72	-	44	1	2	-	9	-	152	1
26	Brookline	45,720	1	-	201	-	4	-	-	-	13	-	9	-
27	Chicopee	45,375	4	-	10	-	31	3	1	1	1	-	13	-
28	Fitchburg	45,190	8	1	5	-	27	4	-	-	-	-	16	-
29	Everett	43,265	1	1	77	-	48	-	-	-	3	-	44	-
30	Salem	42,985	7	1	24	-	70	4	1	2	-	-	-	-
31	Taunton	40,555	3	1	12	-	8	-	1	1	-	-	12	-
32	Waltham	37,105	43	7	92	-	38	2	2	-	3	-	15	-
33	Revere	35,995	3	-	47	-	17	-	2	-	-	-	42	-
34	Arlington	28,817	4	-	157	-	15	-	1	-	18	-	19	1
35	Watertown	27,960	67	2	16	-	25	-	-	-	2	-	19	-
36	Northampton	25,500	3	-	131	-	13	1	6	3	21	-	23	-
37	CITIES AND TOWNS, 10,000-25,000.	708,955	42	3	1376	-	474	34	17	3	110	-	250	-
38	Methuen	23,955	-	-	63	-	8	3	2	1	-	-	-	-
39	Gloucester	23,630	1	-	4	-	24	5	-	-	2	-	-	-
40	Leominster	23,585	3	-	29	-	-	-	-	-	2	-	6	-
41	Framingham	23,580	1	-	154	-	1	-	1	-	7	-	95	-
42	North Adams	22,985	1	-	17	-	8	1	1	-	-	-	-	-
43	Beverly	22,760	2	1	34	-	5	-	-	-	2	-	13	-
44	Melrose	21,375	3	1	24	-	15	1	-	-	6	-	13	-
45	Attleboro	21,170	1	-	27	-	19	-	-	-	2	-	5	-
46	Peabody	20,060	2	-	14	-	13	-	1	-	2	-	5	-
47	Gardner	19,810	-	-	11	-	4	-	1	-	-	-	3	-
48	Westfield	19,795	1	1	17	-	23	3	1	-	4	-	1	-
49	Woburn	19,480	1	-	12	-	37	3	-	-	-	-	-	-
50	Weymouth	18,610	2	-	20	-	8	-	1	-	-	-	-	-
51	Belmont	18,045	3	-	79	-	21	-	-	-	12	-	1	-
52	Wakefield	17,210	4	-	13	-	8	-	-	-	1	-	1	-
53	Marlborough	16,980	-	-	43	-	17	-	-	-	1	-	2	-
54	Winthrop	16,590	-	-	19	-	8	-	-	-	7	-	8	-
55	West Springfield	16,485	1	-	9	-	42	4	-	-	-	-	-	-
56	Southbridge	16,255	1	-	11	-	13	3	-	-	-	-	-	-
57	Dedham	15,850	3	-	2	-	5	-	-	-	-	-	-	-
58	Newburyport	15,675	1	-	48	-	2	-	-	-	1	-	6	-
59	Milford	15,585	-	-	7	-	13	-	-	-	8	-	2	-
60	Greenfield	15,110	1	-	119	-	28	3	3	1	4	-	10	-
61	Norwood	15,090	1	-	36	-	2	-	-	-	-	-	-	-
62	Milton	15,010	2	-	55	-	5	1	-	-	9	-	6	-
63	Clinton	14,920	-	-	14	-	1	-	1	1	-	-	3	-
64	Braintree	14,805	-	-	26	-	9	-	-	-	1	-	5	-
65	Natick	14,080	2	-	17	-	6	1	-	-	6	-	8	-
66	Saugus	13,895	1	-	9	-	36	-	-	-	-	-	7	-
67	Adams	13,865	-	-	12	-	8	-	-	-	-	-	-	-
68	Webster	13,465	-	-	3	-	1	2	-	-	-	-	-	-
69	Plymouth	13,250	-	-	26	-	10	1	-	-	23	-	18	-
70	Fairhaven	12,710	-	-	9	-	9	1	2	-	2	-	-	-
71	Winchester	12,220	1	-	126	-	5	-	-	-	2	-	1	-
72	Danvers	12,220	-	-	17	-	4	-	-	-	-	-	-	-
73	Amesbury	11,965	-	-	41	-	2	-	-	-	-	-	8	-
74	Easthampton	11,785	-	-	5	-	1	-	1	-	1	-	5	-
75	Palmer	11,750	-	-	-	-	3	1	-	-	-	-	-	-

to the Public Health, 1928.

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1305	520	4785	2163	41519	265	7215	7	1630	-	10473	90	1569	164	4873	2690	757	433	310	36	8023	208	1
310	57	1580	574	8231	77	284	-	975	-	2366	33	734	67	1560	573	290	95	65	5	1889	49	2
31	31	301	127	978	6	1335	1	97	-	334	1	135	11	201	135	31	20	6	1	463	10	3
182	84	1024	397	8792	67	1253	1	201	-	1793	9	292	24	964	492	185	91	74	13	969	33	4
30	22	169	73	1058	7	895	1	12	-	494	2	92	3	120	52	20	19	13	-	201	4	7
40	15	174	74	1493	19	23	-	43	-	306	2	62	8	162	108	25	15	29	6	114	3	8
41	6	238	72	2108	10	41	-	18	-	287	-	30	1	175	109	23	5	4	1	221	8	9
14	20	87	30	514	2	111	-	96	-	95	1	24	8	198	99	69	26	10	3	181	8	10
23	6	67	39	1368	8	25	-	14	-	75	1	52	1	105	68	20	12	6	1	11	-	11
23	10	134	49	1400	10	137	-	7	-	313	3	22	3	121	23	13	11	5	-	94	3	12
11	5	155	60	851	11	21	-	11	-	223	-	10	-	83	33	15	3	7	2	147	7	13
114	60	466	212	7235	24	447	-	242	-	1355	12	130	14	429	173	74	61	28	6	1076	25	14
7	11	62	38	233	-	38	-	107	-	99	2	51	3	58	25	18	11	7	2	107	7	15
31	7	47	28	1870	7	4	-	-	-	241	3	2	2	70	19	14	5	-	-	102	4	16
2	5	56	27	1091	1	255	-	122	-	433	2	37	2	66	21	14	4	7	1	208	2	17
13	9	41	30	457	4	75	-	-	-	135	3	2	4	46	40	3	16	1	-	39	5	18
10	2	61	22	1670	4	23	-	-	-	102	-	3	-	52	25	6	7	3	-	359	1	19
6	11	80	14	874	5	10	-	4	-	165	2	1	1	61	16	6	5	2	-	106	3	20
6	3	72	16	1038	3	35	-	8	-	157	-	6	1	42	12	9	7	4	-	126	1	21
39	12	47	37	2	-	7	-	-	-	23	-	28	1	34	15	4	6	4	3	29	2	22
228	55	559	245	3969	22	490	1	42	-	1050	12	118	13	633	292	72	55	54	2	1050	31	23
80	3	112	33	305	2	1	-	6	-	74	1	22	6	90	31	12	9	3	-	61	1	24
27	2	60	27	120	-	74	-	4	-	157	1	18	1	52	23	5	3	3	-	89	3	25
16	2	45	18	532	3	13	-	3	-	89	1	6	-	42	18	3	4	6	-	188	1	26
7	14	29	19	111	29	5	-	5	-	60	-	5	-	45	27	3	4	17	2	37	2	27
5	5	39	29	252	7	27	-	1	-	19	-	10	1	48	23	8	7	11	-	9	-	28
43	3	75	24	398	5	8	-	5	-	95	-	8	-	54	8	8	-	3	-	59	7	29
8	2	39	15	185	1	3	-	8	-	141	3	1	3	41	16	6	8	2	-	39	2	30
7	10	18	21	192	2	47	-	4	-	50	2	21	-	58	46	5	6	1	-	48	5	31
5	4	27	15	313	-	55	1	2	-	53	-	7	-	42	16	5	6	2	-	115	7	32
9	1	48	19	230	-	6	-	1	-	103	2	6	-	22	9	5	3	1	-	65	2	33
1	3	30	12	987	1	60	-	2	-	119	1	1	-	47	11	3	1	1	-	240	-	34
15	3	23	4	312	1	15	-	1	-	73	1	8	-	29	6	4	1	2	-	44	-	35
5	3	14	9	32	-	122	-	-	-	17	-	5	2	63	58	5	3	2	-	56	1	36
207	98	538	299	6933	26	1603	2	52	-	2094	9	103	14	627	289	67	49	50	6	1386	27	37
-	3	4	3	458	2	58	-	-	-	37	-	-	-	17	12	5	2	1	-	65	-	38
-	-	12	9	25	-	4	-	5	-	66	-	-	2	22	8	-	-	4	-	2	-	39
13	12	33	11	55	-	155	-	-	-	12	1	6	-	27	6	2	-	2	-	47	4	40
5	4	13	10	408	1	405	-	-	-	177	-	54	-	25	12	2	3	1	-	137	1	41
2	4	17	7	44	-	9	1	-	-	37	1	-	-	23	4	3	4	2	-	15	2	42
7	4	31	19	104	-	35	-	1	-	96	-	10	-	15	3	3	-	-	-	16	-	43
5	2	29	8	388	1	4	-	15	-	116	-	2	-	22	5	6	2	3	1	34	-	44
5	3	19	16	21	-	153	-	1	-	115	1	-	1	73	24	6	1	3	1	13	1	45
1	3	11	8	165	-	2	-	-	-	39	-	4	1	23	5	1	1	-	-	29	2	46
10	2	14	12	83	1	42	-	-	-	20	-	2	1	35	10	6	3	5	2	3	1	47
10	5	15	9	9	-	39	-	1	-	24	-	-	-	17	19	-	2	-	-	56	1	48
1	1	5	10	3	545	1	7	-	-	112	1	-	-	13	6	-	-	1	-	15	-	49
9	3	5	6	148	2	8	-	-	-	70	-	-	1	18	6	-	2	1	-	9	-	50
9	-	20	10	507	1	10	-	2	-	53	-	2	1	21	8	2	1	3	1	166	-	51
-	1	20	7	433	1	5	-	1	-	33	-	-	-	13	3	2	1	3	-	18	-	52
-	2	16	9	316	2	12	-	-	-	92	-	-	-	13	4	1	1	2	-	5	-	53
7	2	15	11	293	-	39	-	-	-	153	-	2	-	4	4	1	1	-	-	41	-	54
1	2	7	2	71	-	18	-	-	-	56	-	-	-	15	4	-	-	1	-	-	-	55
4	1	7	5	13	-	8	-	1	-	19	-	4	1	10	2	-	-	1	-	7	4	56
2	1	14	3	123	2	5	-	-	-	13	-	-	-	6	4	2	-	-	-	4	-	57
4	4	7	5	63	-	46	-	-	-	37	1	-	-	5	9	1	1	1	-	9	-	58
4	2	6	4	7	-	46	-	3	-	40	-	-	-	4	3	2	2	3	-	54	-	59
1	1	2	6	203	4	1	-	1	-	12	-	-	-	7	6	1	1	-	-	16	-	60
-	-	12	7	303	-	6	-	2	-	42	-	-	-	7	4	-	-	1	-	63	-	61
-	3	21	9	58	-	32	1	1	-	28	1	5	1	7	5	-	-	-	-	-	-	62
2	2	7	4	161	-	12	-	-	-	130	-	2	-	10	45	1	-	-	-	9	-	63
-	4	4	9	267	-	14	-	-	-	52	1	1	-	11	3	-	-	-	-	63	-	64
15	3	4	6	110	-	19	-	-	-	59	-	-	-	9	3	1	-	-	-	8	-	65
-	-	23	9	3	-	5	-	2	-	39	1	-	-	14	6	-	1	-	-	-	-	66
1	-	-	6	-	1	-	-	-	-	2	-	-	-	2	3	-	1	-	-	-	-	67
-	8	11	4	301	4	2	-	-	-	41	-	3	2	16	2	3	4	-	-	13	-	68
-	1	2	1	120	-	1	-	3	-	21	1	-	-	17	2	1	1	2	-	57	-	69
1	1	13	6	334	-	5	-	1	-	31	-	-	-	10	3	1	-	-	-	72	-	70
-	4	2	9	40	-	6	-	2	-	34	-	-	1	9	16	-	3	-	-	32	-	71
1	-	19	5	276	-	126	-	-	-	11	-	1	-	5	4	1	-	1	1	24	1	72
1	-	38	5	14	-	14	-	-	-	35	-	-	-	3	4	-	-	1	-	4	1	73
5	-	5	2	2	-	-	-	-	-	12	-	-	-	9	1	1	1	1	-	-	1	74

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation estimated as of July 1, 1928.	An- terior Poli- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Mening- itis.		Ger- man Mea- sles.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
76	Andover	11,540	-	-	82	-	2	-	-	-	-	-	-	-
77	Wellesley	10,795	-	-	35	-	3	-	1	-	3	-	1	-
78	Dartmouth	10,590	1	-	14	-	12	-	-	-	-	-	-	-
79	Needham	10,185	1	-	17	-	1	-	-	-	2	-	4	-
80	North Attleborough	10,125	-	-	10	-	22	1	-	-	-	-	-	-
81	Bridgewater	10,100	1	-	46	-	10	-	-	-	-	-	13	-
82	CITIES AND TOWNS, 5,000-10,000.	365,475	38	1	593	-	231	16	6	1	44	-	124	-
83	Northbridge	9,975	-	-	18	-	-	-	-	-	-	-	-	-
84	Stoneham	9,830	-	-	4	-	1	-	-	-	1	-	-	-
85	Ludlow	9,620	-	-	17	-	30	2	-	-	-	-	3	-
86	Middleborough	9,555	-	-	5	-	1	-	1	-	1	-	-	-
87	Athol	9,480	11	1	2	-	-	-	-	-	2	-	3	-
88	Swampscott	9,480	1	-	51	-	29	-	-	-	2	-	2	-
89	Reading	9,470	2	-	2	-	-	-	-	-	-	-	1	-
90	Marblehead	8,760	3	-	55	-	-	-	-	-	1	-	5	-
91	Ware	8,690	-	-	1	-	-	-	-	-	-	-	-	-
92	Lexington	8,665	1	-	22	-	-	-	-	-	3	-	-	-
93	Stoughton	8,465	1	-	3	-	29	3	-	-	-	-	-	-
94	Hudson	8,455	1	-	9	-	-	-	-	-	1	-	-	-
95	Maynard	8,330	-	-	8	-	2	-	-	-	1	-	-	-
96	Whitman	8,290	-	-	-	-	2	1	-	-	-	-	-	-
97	Rockland	8,220	-	-	11	-	-	-	-	-	15	-	-	-
98	Montague	8,155	-	-	-	-	2	-	-	-	-	-	-	-
99	Concord	7,420	-	-	36	-	1	-	-	-	-	-	83	-
100	Franklin	7,396	-	-	17	-	1	-	-	-	-	-	6	-
101	South Hadley	7,275	-	-	45	-	2	-	-	-	1	-	-	-
102	North Andover	7,190	-	-	4	-	4	-	-	-	-	-	-	-
103	Walpole	7,164	8	-	4	-	-	-	-	-	1	-	4	-
104	Shrewsbury	7,125	1	-	-	-	-	-	-	-	-	-	-	-
105	Chelmsford	7,120	-	-	21	-	4	1	2	-	5	-	1	-
106	Dracut	7,088	-	-	-	-	1	3	-	-	-	-	-	-
107	Agawam	7,070	1	-	4	-	18	1	1	1	1	-	-	-
108	Grafton	7,025	-	-	-	-	6	-	-	-	-	-	-	-
109	Millbury	6,925	1	-	29	-	7	-	-	-	1	-	-	-
110	Spencer	6,890	-	-	2	-	-	-	-	-	-	-	-	-
111	Mansfield	6,798	-	-	27	-	14	-	-	-	-	-	-	-
112	Westborough	6,690	-	-	3	-	1	-	-	-	-	-	1	-
113	Uxbridge	6,660	-	-	-	-	1	-	1	-	1	-	-	-
114	Hingham	6,495	1	-	22	-	-	-	-	-	-	-	-	-
115	Great Barrington	6,460	2	-	1	-	7	-	-	-	-	-	-	-
116	Barnstable	6,350	-	-	43	-	3	-	-	-	1	-	1	-
117	Winchendon	6,335	-	-	-	-	-	-	-	-	-	-	-	-
118	Wareham	6,320	-	-	2	-	11	-	-	-	2	-	10	-
119	Amherst	6,228	-	-	28	-	1	-	1	-	2	-	-	-
120	Randolph	6,190	-	-	4	-	-	-	-	-	-	-	-	-
121	Ipswich	5,960	2	-	3	-	1	-	-	-	-	-	3	-
122	Abington	5,940	1	-	-	-	1	-	-	-	-	-	-	-
123	Canton	5,870	-	-	5	-	5	-	-	-	-	-	-	-
124	Billerica	5,695	-	-	28	-	1	-	-	-	-	-	-	-
125	Somerset	5,620	-	-	-	-	9	1	-	-	-	-	-	-
126	Auburn	5,565	-	-	9	-	-	-	-	-	-	-	-	-
127	Easton	5,510	-	-	13	-	9	1	-	-	-	-	1	-
128	Falmouth	5,430	-	-	10	-	18	-	-	-	2	-	-	-
129	Foxborough	5,425	-	-	12	-	1	-	-	-	-	-	-	-
130	Tewksbury	5,310	-	-	-	-	4	-	-	-	-	-	-	-
131	Monson	5,246	-	-	9	-	3	-	-	-	-	-	-	-
132	Dudley	5,140	1	-	4	-	3	-	-	-	-	-	-	-
133	Blackstone	5,110	-	-	-	-	1	-	-	-	-	-	-	-
134	TOWNS, 2,500-5,000.	197,075	19	3	310	-	85	4	2	-	19	-	40	-
135	Seekonk	4,990	-	-	-	-	16	-	-	-	-	-	-	-
136	Orange	4,985	9	2	5	-	3	-	1	-	3	-	-	-
137	Westport	4,880	-	-	17	-	-	-	1	-	-	-	-	-
138	Acushnet	4,790	-	-	2	-	-	-	-	-	-	-	-	-
139	Templeton	4,580	-	-	-	-	2	2	-	-	-	-	2	-
140	Leicester	4,400	-	-	-	-	1	-	-	-	-	-	-	-
141	Dalton	4,300	1	-	-	-	3	-	-	-	-	-	-	-
142	Warren	4,245	-	-	22	-	-	-	-	-	-	-	6	-
143	Williamstown	4,185	-	-	1	-	-	-	-	-	2	-	-	-
144	Oxford	4,150	-	-	5	-	5	-	-	-	-	-	-	-
145	Wilmington	4,091	-	-	-	-	3	-	-	-	-	-	-	-
146	Lee	4,040	-	-	-	-	-	-	-	-	-	-	-	-
147	Medfield	4,035	1	-	1	-	-	-	-	-	-	-	-	-
148	Rockport	3,990	-	-	5	-	1	-	-	-	-	-	-	-
149	Westford	3,818	-	-	50	-	3	-	-	-	-	-	-	-
150	Swansea	3,815	-	-	-	-	-	1	-	-	-	-	-	-

to the Public Health, 1928 — Continued.

Influenza.	Lobar Pneumonia.	Measles.	Mumps.	Ophthalmia.	Scarlet Fever.	Syphilis.	Tuberculosis, Pulmonary.	Tuberculosis, Other Forms.	Typhoid Fever.	Whooping Cough.	Line No.	
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
5	5	14	5	145	1	3	-	-	-	34	-	76
-	-	8	4	92	-	11	-	-	-	32	-	77
-	-	3	6	38	-	49	-	-	-	23	2	78
2	-	1	-	103	1	9	-	-	-	126	1	79
2	-	2	3	14	-	26	-	-	-	6	-	80
72	1	13	5	37	1	142	-	-	-	28	-	81
88	64	189	144	2760	14	692	1	7	-	618	16	82
6	3	13	10	1	22	-	-	-	-	3	-	83
4	-	7	3	168	1	2	-	-	-	22	-	84
1	1	1	1	24	-	77	-	-	-	-	-	85
1	3	3	3	113	-	32	-	-	-	23	1	86
1	3	-	1	388	1	1	-	-	-	-	-	87
1	11	2	2	95	-	89	-	-	-	51	-	88
3	2	1	1	14	-	-	-	-	-	4	-	89
4	4	4	2	18	-	57	-	-	-	1	-	90
4	1	6	4	30	1	1	-	-	-	-	-	91
-	3	1	6	137	1	36	-	-	-	13	1	92
-	3	1	6	22	4	9	-	-	-	13	1	93
-	3	9	2	99	1	-	-	-	-	1	-	94
-	3	2	3	24	-	-	-	-	-	2	-	95
-	3	2	3	8	-	-	-	-	-	-	-	96
-	7	5	9	-	6	-	-	-	2	12	-	97
-	2	3	3	-	-	-	-	-	-	-	-	98
3	1	6	7	8	-	6	-	-	-	16	-	99
1	3	2	1	5	-	16	-	-	1	-	-	100
35	1	2	2	43	101	4	-	-	-	24	1	101
2	-	9	-	151	1	2	-	-	-	2	-	102
-	3	-	-	162	1	-	-	-	-	41	1	103
1	1	4	1	113	-	3	-	-	-	1	-	104
-	1	1	2	9	-	-	-	-	-	-	-	105
-	2	-	2	9	3	-	-	-	1	2	2	107
-	1	-	8	-	-	-	-	-	-	-	2	108
-	1	21	5	14	7	-	-	-	-	61	-	109
4	2	3	2	21	-	-	-	-	-	21	1	110
-	1	11	4	9	2	-	-	-	-	14	-	111
-	2	2	9	2	7	-	-	-	-	4	-	112
-	-	4	3	4	1	1	-	-	-	-	-	113
-	-	3	1	181	-	2	-	-	-	6	-	114
-	2	7	3	50	2	-	-	-	-	5	-	115
3	3	1	3	19	56	-	-	-	-	63	-	116
-	3	1	2	180	-	4	-	-	-	-	-	117
-	4	4	-	13	6	-	-	-	-	30	-	118
-	3	1	1	11	15	-	-	-	-	14	-	119
5	1	5	2	72	2	-	-	-	-	17	1	120
1	3	-	1	6	1	-	-	-	-	7	-	121
1	3	-	1	-	-	-	-	-	-	-	-	122
-	1	-	6	102	1	5	-	-	-	8	-	123
-	-	1	1	34	-	6	-	-	-	1	1	124
-	-	1	1	3	-	-	-	-	-	1	1	125
-	-	1	2	10	41	-	-	-	-	50	-	126
4	1	6	5	23	6	-	-	-	-	14	-	127
5	1	-	1	254	19	-	-	-	-	41	2	128
-	1	7	8	16	10	-	-	-	-	11	-	129
1	1	-	1	2	-	-	-	-	-	-	-	130
-	1	5	1	2	25	-	-	-	-	1	-	131
-	1	3	-	43	15	-	-	-	-	19	-	132
-	-	3	-	-	-	-	-	-	-	-	2	133
78	33	71	83	1376	25	623	-	-	-	154	3	134
1	1	-	4	16	-	-	-	-	-	-	-	135
-	-	-	1	13	1	12	-	-	-	-	-	136
-	1	-	-	7	-	-	-	-	-	1	-	137
-	1	-	-	1	-	9	-	-	-	4	-	138
53	6	3	3	1	-	9	-	-	-	-	4	139
-	-	-	-	2	-	1	-	-	-	-	-	140
-	2	-	3	-	-	-	-	-	-	-	-	141
3	1	4	2	171	1	34	-	-	-	-	-	142
-	2	-	-	7	-	1	-	-	-	2	-	143
-	1	-	4	13	1	46	-	-	-	15	-	144
-	-	2	4	2	-	-	-	-	-	2	1	145
-	-	1	11	4	-	-	-	-	-	-	-	146
3	-	1	1	5	-	1	-	-	-	-	-	147
-	-	2	3	35	1	38	-	-	-	-	-	148
-	1	2	3	2	1	-	-	-	-	14	-	149
-	-	1	1	-	1	-	-	-	-	-	-	150

Influenza.	Lobar Pneumonia.	Measles.	Mumps.	Ophthalmia.	Scarlet Fever.	Syphilis.	Tuberculosis, Pulmonary.	Tuberculosis, Other Forms.	Typhoid Fever.	Whooping Cough.	Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	-	-	2	11	12	-	-	-	-	-	226
-	-	-	1	27	-	-	-	-	-	3	-
-	1	1	-	39	1	25	-	-	-	11	-
-	-	2	-	15	-	-	14	2	-	3	2
-	-	-	-	42	-	-	-	1	-	-	230
-	-	-	-	7	-	-	-	2	-	-	231
-	-	-	-	14	1	-	1	3	-	-	232
-	-	1	-	1	-	-	-	2	-	-	233
-	1	2	-	7	10	3	3	1	-	23	1
1	2	-	1	5	2	-	-	2	-	18	1
-	-	-	1	1	13	-	-	1	-	20	-
-	-	-	3	-	-	-	-	1	-	5	1
-	-	1	1	1	1	-	2	1	-	1	-
-	1	1	1	45	1	-	11	-	-	-	-
2	-	-	2	1	-	-	1	-	-	1	-
-	-	-	-	1	-	-	-	1	-	1	-
-	-	-	1	18	-	-	-	-	-	-	-
-	-	-	-	3	4	-	1	-	-	-	-
-	-	1	-	-	-	-	-	2	-	-	-
-	-	1	2	-	5	-	-	1	-	-	-
-	-	1	-	-	-	-	-	-	-	-	-
-	1	1	1	9	-	-	2	-	-	-	-
-	1	1	1	5	-	-	12	-	-	-	-
-	1	1	-	2	-	-	1	-	-	4	-
-	1	1	2	-	1	1	-	2	-	-	-
1	2	-	-	2	2	-	-	1	-	11	-
-	2	-	-	93	-	-	12	1	-	1	-
-	-	-	-	3	-	-	1	2	-	13	-
-	-	-	-	-	-	-	4	1	-	28	-
-	-	-	-	-	-	-	-	32	6	-	-
-	-	-	-	-	-	-	-	-	14	-	-
-	-	1	13	-	5	-	22	-	-	1	-
-	-	-	6	-	-	-	8	-	-	8	-
-	2	-	-	-	1	-	1	-	-	-	-
-	-	-	-	-	-	-	5	-	-	-	-
-	-	-	-	-	-	-	2	-	-	-	-
-	-	-	3	2	-	-	1	-	-	-	-
-	-	1	1	2	-	-	1	-	-	-	-
-	-	-	-	-	1	-	-	-	-	29	-
-	1	-	-	-	-	-	1	-	-	-	-
-	-	-	-	-	-	-	1	-	-	-	-
-	-	-	3	-	-	-	-	2	-	-	-
-	1	-	-	1	-	-	-	-	-	8	-
-	1	-	-	-	-	-	-	-	-	-	-
-	1	-	1	-	-	-	1	-	-	-	-
-	1	-	-	1	-	-	-	-	-	-	-
-	-	4	1	6	30	-	3	-	-	2	-
-	-	-	14	-	-	-	2	-	-	-	-
-	-	-	-	-	1	-	-	-	1	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	1	-	1	-	-	-	-	-	-	-	-
-	-	1	1	-	-	-	-	-	-	-	-
-	-	1	1	-	4	-	5	-	-	-	-
4	9	13	21	241	116	1	51	1	-	47	1
-	-	2	2	4	6	-	1	-	-	2	-
-	-	-	-	1	1	-	3	-	-	-	-
-	-	1	2	-	-	-	-	-	-	7	-
-	-	-	-	-	1	-	-	-	-	-	-
-	-	1	-	7	67	-	5	-	-	-	-
-	-	2	1	6	1	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	1	1	2	-	2	-	-	-	-	-	-
-	1	-	1	20	1	-	13	-	-	-	-
-	-	-	1	25	-	-	-	-	-	9	-
-	-	-	-	-	15	-	-	-	-	-	-
-	-	-	-	2	-	-	-	-	-	-	-
-	-	-	-	1	-	-	-	-	-	22	-

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS GROUPED IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1928.	An- terior Polio- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
301	Royalston	820	-	-	-	-	-	-	-	-	-	-	-	-
302	Wellfleet	763	-	-	-	-	-	-	-	-	-	-	-	-
303	Enfield	726	-	-	11	-	-	-	-	-	-	-	-	-
304	Dana	693	-	-	-	-	-	-	-	-	-	-	-	-
305	Petersham	688	-	-	-	-	-	-	-	-	-	-	-	-
306	Richmond	655	-	-	-	-	-	-	-	-	-	-	-	-
307	Paxton	653	-	-	-	-	-	-	-	-	-	-	-	-
308	Leverett	648	-	-	-	-	-	-	-	-	-	-	-	-
309	Halifax	645	-	-	-	-	-	-	-	-	-	-	-	-
310	Hampden	635	-	-	-	-	3	-	-	-	2	-	-	-
311	Harvard	627	-	-	-	-	-	-	-	-	-	-	-	-
312	Granville	583	-	-	15	-	-	-	-	-	-	-	-	-
313	Boxford	580	-	-	-	-	-	-	-	-	-	-	-	-
314	Oakham	550	-	-	-	-	-	-	-	-	-	-	-	-
315	Sherborn	542	-	-	-	-	-	-	-	-	-	-	-	-
316	Carlisle	535	-	-	1	-	1	-	-	-	-	-	-	-
317	Hancock	535	-	-	-	-	1	-	-	-	-	-	-	-
318	Plympton	534	-	-	-	-	-	-	-	-	-	-	-	-
319	Eastham	533	-	-	-	-	-	-	-	-	-	-	-	-
320	Pelham	525	-	-	-	-	-	-	-	-	-	-	-	-
321	New Salem	522	-	-	-	-	-	-	-	-	-	-	-	-
322	Cummington	520	-	-	-	-	-	-	-	-	-	-	-	-
323	Egremont	497	-	-	-	-	1	-	-	-	-	-	-	-
324	Sandisfield	493	-	-	-	-	-	-	-	-	-	-	-	-
325	Greenwich	480	-	-	-	-	1	-	-	-	-	-	-	-
326	Truro	478	-	-	-	-	-	-	-	-	-	-	-	-
327	Chesterfield	445	-	-	-	-	-	-	-	-	1	-	2	-
328	Worthington	442	-	-	1	-	-	-	-	-	-	-	-	-
329	Wales	440	-	-	-	-	-	-	-	-	-	-	-	-
330	New Braintree	439	-	-	-	-	-	-	-	-	-	-	-	-
331	Wendell	429	1	-	-	-	-	-	-	-	-	-	-	-
332	Otis	415	-	-	-	-	-	-	-	-	-	-	-	-
333	Blandford	414	-	-	-	-	-	-	-	-	1	-	-	-
334	Florida	400	-	-	-	-	-	-	-	-	-	-	-	-
335	Phillipston	400	-	-	-	-	-	-	-	-	-	-	-	-
336	Monterey	387	-	-	1	-	-	-	-	-	-	-	-	-
337	Warwick	384	-	-	-	-	-	-	-	-	-	-	-	-
338	Windsor	380	-	-	-	-	-	-	-	-	-	-	1	-
339	Savoy	379	-	-	-	-	-	-	-	-	-	-	-	-
340	Westhampton	357	-	-	-	-	-	-	-	-	-	-	-	-
341	Boxborough	353	-	-	-	-	-	-	-	-	-	-	-	-
342	Hawley	334	-	-	-	-	-	-	-	-	-	-	-	-
343	Dunstable	330	-	-	-	-	-	-	-	-	-	-	-	-
344	Mashpee	330	-	-	-	-	-	-	-	-	-	-	-	-
345	West Tisbury	325	-	-	-	-	-	-	-	-	-	-	-	-
346	Tyringham	285	-	-	-	-	-	-	-	-	-	-	-	-
347	Heath	282	-	-	-	-	-	-	-	-	-	-	-	-
348	Rowe	269	-	-	-	-	-	-	-	-	-	-	-	-
349	Goshen	267	-	-	-	-	-	-	-	-	-	-	-	-
350	Plainfield	255	-	-	-	-	-	-	-	-	-	-	-	-
351	Chilmark	240	-	-	-	-	-	-	-	-	-	-	-	-
352	Leyden	233	-	-	-	-	-	-	-	-	-	-	-	-
353	Washington	230	-	-	-	-	-	-	-	-	-	-	-	-
354	Prescott	230	1	-	-	-	-	-	-	-	-	-	-	-
355	Alford	205	-	-	-	-	-	-	-	-	-	-	-	-
356	Montgomery	195	-	-	-	-	-	-	-	-	-	-	-	-
357	Shutesbury	188	-	-	-	-	-	-	-	-	-	-	-	-
358	Middlefield	187	-	-	1	-	-	-	-	-	-	-	-	-
359	Gay Head	181	-	-	-	-	-	-	-	-	-	-	-	-
360	Gosnold	145	-	-	-	-	-	-	-	-	-	-	-	-
361	Holland	138	-	-	-	-	-	-	-	-	-	-	-	-
362	Monroe	127	-	-	-	-	-	-	-	-	-	-	-	-
363	Tolland	127	-	-	-	-	-	-	-	-	-	-	-	-
364	Peru	93	-	-	-	-	-	-	-	-	-	-	-	-
365	New Ashford	89	-	-	-	-	-	-	-	-	-	-	-	-
366	Mount Washington	51	-	-	-	-	-	-	-	-	-	-	-	-
367	Tewksbury State Infirmary	-	-	-	15	1	-	-	1	-	-	-	4	-

to the Public Health, 1928 — Concluded.

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1	-	1	-	32	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	301
-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	302
-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	303
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	304
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	305
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	306
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	307
-	-	-	-	1	1	-	-	1	-	-	-	-	-	1	-	-	-	1	-	2	-	308
-	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	309
-	-	-	-	1	1	-	-	-	-	4	-	-	-	1	-	-	-	-	-	-	-	310
-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	311
-	-	-	-	16	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	312
-	-	-	-	8	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	313
-	-	-	-	36	-	7	-	-	-	-	-	-	-	1	2	-	-	-	-	1	-	314
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	315
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	316
-	-	-	-	4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	317
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	318
1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	319
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	320
1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	321
-	-	1	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	322
-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	323
-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	324
-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	325
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	326
-	-	-	-	11	-	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	327
-	-	-	-	19	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	328
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	329
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330
-	-	2	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	331
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	332
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	333
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	334
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	335
-	-	1	-	-	-	-	-	-	-	2	-	-	-	-	3	-	-	-	-	-	-	336
-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	337
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	339
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	340
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	341
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-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	343
-	-	1	-	1	-	1	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	344
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	345
-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	346
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	347
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-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	349
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-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	352
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	353
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	354
-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	355
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	356
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-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	360
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	361
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	362
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	363
-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	364
-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	365
53	2	8	13	-	-	2	-	1	-	5	-	2	7	60	94	3	1	-	-	-	-	366

In addition to the foregoing there occurred 3 cases of *actinomycosis* with 3 deaths.

	Cases.	Deaths.
Boston	2	2
Lynn	1	1
8 cases of <i>anthrax</i> :		
Andover	1	-
Haverhill	3	-
Lynn	3	-
Malden	1	-
1,462 cases of <i>dog bite</i> :		
Acton	3	-
Adams	4	-
Agawam	1	-
Amesbury	5	-
Amherst	2	-
Andover	3	-
Arlington	22	-
Ashland	2	-
Attleboro	3	-
Avon	1	-
Barnstable	2	-
Belmont	12	-
Beverly	5	-
Billerica	4	-
Boston	301	-
Braintree	13	-
Bridgewater	2	-
Brockton	18	-
Brookline	8	-
Cambridge	81	-
Canton	9	-
Chelmsford	26	-
Chelsea	36	-
Chicopee	9	-
Clinton	7	-
Cohasset	1	-
Danvers	13	-
Dartmouth	3	-
Easthampton	2	-
Easton	2	-
Everett	7	-
Fairhaven	1	-
Fall River	21	-
Falmouth	3	-
Fitchburg	5	-
Frammingham	9	-
Franklin	2	-
Georgetown	1	-
Gloucester	15	-
Great Barrington	4	-
Greenfield	8	-
Groveland	3	-
Hamilton	1	-
Hanover	1	-
Hanson	1	-
Harwich	1	-
Hatfield	2	-
Haverhill	26	-
Hingham	1	-
Holden	1	-
Holyoke	12	-
Hopedale	3	-
Hopkinton	2	-
Hudson	1	-
Ipswich	1	-
Lancaster	3	-
Lawrence	22	-
Leominster	1	-
Lexington	5	-
Littleton	1	-
Lowell	134	-
Ludlow	2	-
Lunenburg	2	-
Lynn	50	-
Malden	21	-
Mansfield	8	-
Marblehead	3	-
Marlborough	11	-
Mattapoisett	1	-
Medford	12	-
Melrose	13	-
Merrimac	2	-
Methuen	3	-
Milford	1	-
Millbury	3	-
Milton	5	-

	Cases.	Deaths.
Monson	3	-
Needham	12	-
New Bedford	11	-
Newburyport	2	-
Newton	24	-
North Adams	3	-
North Andover	1	-
North Reading	1	-
Northampton	1	-
Oxford	1	-
Palmer	1	-
Peabody	12	-
Pittsfield	6	-
Plymouth	1	-
Quincy	22	-
Revere	62	-
Rockport	3	-
Salem	12	-
Saugus	3	-
Somerset	2	-
Somerville	23	-
South Hadley	1	-
Southbridge	3	-
Spencer	1	-
Springfield	68	-
Stoughton	2	-
Swampscott	3	-
Taunton	10	-
Templeton	1	-
Walpole	4	-
Waltham	10	-
Watertown	5	-
Wellesley	4	-
West Boylston	1	-
West Springfield	6	-
Westboro	1	-
Westfield	7	-
Westford	1	-
Weston	1	-
Westport	4	-
Westwood	1	-
Weymouth	5	-
Wilmington	1	-
Winchester	8	-
Winthrop	29	-
Woburn	4	-
Worcester	38	-
Wrentham	1	-
Yarmouth	1	-

25 cases of *dysentery* with 15 deaths:

Boston	6	3
Chelsea	8	1
Fall River	1	1
Holyoke	1	-
Leominster	1	1
Somerville	1	-
Worcester	7	9

74 cases of *encephalitis lethargica* with 56 deaths:

Belmont	-	1
Beverly	1	-
Boston	15	14
Brockton	2	-
Chelsea	-	1
Chicopee	1	1
Concord	1	1
Danvers	1	-
Foxboro	-	1
Frammingham	1	1
Grafton	-	1
Hingham	1	1
Holyoke	-	2
Hudson	1	-
Lawrence	2	1
Lowell	6	3
Lynn	-	1
Manchester	-	1
Marlborough	3	1
Medfield	-	1
Medford	2	-
Melrose	1	1
Methuen	1	-
Middleton	1	1
Newton	-	1
Newburyport	-	1
Northampton	3	3

	Cases.	Deaths.		Cases.	Deaths.
Pittsfield	3	1	Lenox	10	-
Raynham	-	1	Lexington	2	-
Salem	2	1	Lowell	4	1
Saugus	1	1	Lynn	5	-
Somerville	3	2	Malden	3	1
Springfield	1	-	Mansfield	1	-
Taunton	1	-	Marblehead	3	1
Tewksbury State Infirmary	-	1	Marion	1	-
Waltham	1	1	Marshfield	4	-
Wellesley	1	-	Maynard	-	1
West Boylston	1	-	Melrose	8	-
West Springfield	1	-	Merrimac	1	-
Weymouth	1	-	Middleborough	1	1
Woburn	1	-	Middleton	-	1
Worcester	13	10	New Bedford	1	-
2 cases of <i>leprosy</i> :			Newburyport	1	-
Boston	2	-	Newton	1	1
16 cases of <i>malaria</i> with 6 deaths:			North Adams	4	1
Boston	6	-	Northampton	1	1
Brockton	1	-	Northborough	1	1
Cambridge	1	-	Northbridge	1	-
Chelsea	2	1	Northfield	70	-
Fitchburg	-	1	Orange	-	1
Holyoke	1	-	Palmer	-	1
Hudson	-	1	Pelham	1	-
Lynn	-	1	Pittsfield	17	4
Malden	2	-	Plymouth	3	-
Quincy	1	-	Prescott	1	-
Reading	1	-	Quincy	4	-
Raynham	-	1	Shirley	1	-
Swansea	-	1	Somerville	4	1
Wakefield	1	-	Spencer	1	-
20 cases of <i>pellagra</i> with 13 deaths:			Springfield	4	3
Boston	13	8	Stockbridge	4	-
Bridgewater	1	-	Swampscott	1	-
Brookline	-	1	Tyringham	15	-
Chelsea	1	-	Wakefield	2	1
Monson	1	1	Webster	1	-
Newburyport	1	1	Westfield	1	-
Northampton	2	2	Weymouth	1	-
Peabody	1	-	Williamstown	18	-
4 cases of <i>rabies</i> with 4 deaths:			Winthrop	5	1
Boston	1	1	Woburn	1	-
Canton	1	1 ¹	Worcester	6	1
Newton	1	1	19 cases of <i>smallpox</i> :		
Wellesley	1 ²	1 ²	Boston	6	-
500 cases of <i>septic sore throat</i> with 65 deaths:			Bourne	1	-
Amesbury	3	1	Gardner	4	-
Arlington	-	1	Greenfield	1	-
Ashfield	1	-	Leominster	1	-
Becket	3	-	Pittsfield	1	-
Belmont	2	-	Plymouth	1	-
Beverly	4	1	Shelburne	2	-
Boston	87	6	Springfield	1	-
Braintree	2	-	Weymouth	1	-
Brookline	1	-	28 cases of <i>tetanus</i> with 24 deaths:		
Buckland	1	-	Amesbury	1	-
Cambridge	8	1	Attleboro	-	1
Canton	1	-	Boston	4	3
Chelsea	2	-	Braintree	1	-
Chester	1	-	Brockton	-	1
Dartmouth	2	-	Chicopee	1	-
Dracut	1	1	Dighton	1	-
Easton	-	1	Easthampton	1	-
Everett	2	-	Fall River	1	2
Fall River	6	-	Fitchburg	1	1
Framingham	1	-	Greenfield	1	1
Gardner	1	1	Groton	-	1
Gill	1	-	Hudson	1	1
Gloucester	-	1	Lawrence	1	-
Granby	1	1	Lynn	1	1
Greenfield	2	-	New Bedford	2	2
Hampden	2	-	Newton	1	1
Haverhill	1	-	North Adams	2	2
Hawley	-	3	Northampton	-	1
Holyoke	1	-	Norwood	1	-
Lee	149	24	Peabody	1	-
			Pittsfield	2	2
			Rockland	1	-
			Springfield	1	3
			Tewksbury State Infirmary	-	1
			West Springfield	1	-
			Worcester	1	-

¹ Died in Boston hospital.² Reported by Boston and died in a Boston hospital.

		Cases.	Deaths.			Cases.	Deaths.
51 cases of <i>trachoma</i> :				Hampden		1	-
Boston		28	-	Hawley		3	-
Brockton		2	-	Heath		2	-
Cambridge		4	-	Hingham		1	-
Chelsea		5	-	Holden		2	-
Easthampton		1	-	Holyoke		1	-
Everett		1	-	Hudson		1	-
Fitchburg		1	-	Lawrence		2	-
Lawrence		3	-	Lexington		2	-
Lowell		2	-	Lowell		4	-
Medford		1	-	Lynn		15	-
Quincy		1	-	Malden		8	-
Westborough		1	-	Medford		8	-
Worcester		1	-	Melrose		3	-
14 cases of <i>trichinosis</i> with 4 deaths:				Milton		6	-
Fall River		2	-	Natick		19	-
Lynn		1	1	New Bedford		2	-
Malden		1	-	Newton		2	-
Springfield		9	2	North Adams		5	-
Worcester		1	1	Northborough		4	-
571 cases of <i>tuberculosis hilum</i> :				Norwood		2	-
Adams		1	-	Oxford		1	-
Amesbury		4	-	Palmer		37	-
Arlington		1	-	Peabody		1	-
Athol		10	-	Pittsfield		2	-
Attleboro		2	-	Quincy		97	-
Beverly		1	-	Revere		47	-
Boston		85	-	Salem		1	-
Brockton		4	-	Somerville		3	-
Brookline		2	-	Spencer		13	-
Cambridge		47	-	Springfield		15	-
Canton		1	-	Stockbridge		1	-
Chicopee		5	-	Stoneham		7	-
Easton		9	-	Stoughton		1	-
Everett		5	-	Taunton		3	-
Fall River		16	-	Tewksbury State Infirmary		1	-
Fitchburg		11	-	Waltham		1	-
Framingham		3	-	Wareham		4	-
Gardner		1	-	Wenham		1	-
Gloucester		1	-	West Springfield		27	-
Hamilton		1	-	Westborough		1	-
				Winchester		3	-
				Winthrop		1	-

REPORT OF DIVISION OF BIOLOGIC LABORATORIES.

BENJAMIN WHITE, Ph.D., *Director.*

ELLIOTT S. ROBINSON, M.D., Ph.D., *Assistant Director.*

I. ANTITOXIN AND VACCINE LABORATORY.

1. *New Buildings.*

The occupation of the additions to the laboratory and stable buildings has resulted in far greater comfort and convenience in the work. The new buildings are entirely satisfactory and have required practically no changes in construction or equipment since they were completed. The additional stable space has made it possible to accommodate more horses and, therefore, by immunization trial to make a better choice of suitable horses for immunization. The new class room has been of great service for teaching purposes. It is now possible to accommodate at least sixty persons in this room so that demonstrations of the work and short lectures can be given to much larger groups than ever before.

2. *Distribution of Products.*

The following table shows the amounts of the various products distributed each year for the past five years:

PRODUCT.	1924.	1925.	1926.	1927.	1928.
Diphtheria Antitoxin, 1,000 unit doses	442,905	370,412	296,591	346,212	321,202
Antimeningococcic Serum, 15 c.c. doses	3,949	3,262	2,451	2,837	3,643
Antipneumococcic Serum, 100 c.c. doses	335	256	247	185	173
Antipneumococcic Serum, Conc. 15 c.c. doses	—	—	—	—	19
Antipneumococcic Serum, bulk c.c.	—	278,600	215,750	213,490	51,800
Smallpox Vaccine Virus, capillary tubes	249,090	273,153	298,834	294,983	320,091
Typhoid-Paratyphoid Vaccine, 1 c.c. doses	65,512	90,776	88,842	108,387	104,215
Schick Outfits, 50 doses each	6,427	5,403	5,031	5,492	5,747
Diphtheria toxin (bulk) c.c.	140	515	350	630	430
Diphtheria Toxin-Antitoxin Mixture, 1 c.c. doses	309,294	171,405	205,589	332,463	356,739
Scarlet Fever Streptococcus Antitoxin, doses	—	319	3,712	6,114	5,569
Normal Serum, c.c.	39,415	20,290	9,865	23,585	118,150
Silver Nitrate Solution (ampoules)	—	—	—	12,148	69,663
Anti-Measles-Diplococcus Serum, bottles	—	—	—	104	114
Influenza Serum, bottles	—	—	—	26	10

(a) *Diphtheria Antitoxin.*—The slightly smaller amount of this product distributed in 1928 parallels the lower incidence of diphtheria in the State. The production of this antitoxin has continued, although on a somewhat smaller scale, and a reserve supply has been carried which should provide for emergencies or epidemics.

(b) *Antimeningococcic Serum.*—There was a slight increase in the number of bottles of this serum distributed. An emergency stock is carried in anticipation of a possible epidemic.

(c) *Antipneumococcic Serum.*—The decline in the use of the Type I antipneumococcic serum continues and is accounted for by the fact that Dr. Felton of the Harvard School of Medicine has been supplying concentrated and refined antibody solution to some of the Boston hospitals. The production of this serum, however, has continued as usual and about fifty-one liters have been supplied to Dr. Felton for experimental work and for the production of the refined antibody solution to be distributed in Massachusetts.

(d) *Smallpox Vaccine Virus.*—The year's distribution of this product constitutes a high record. The increased demand undoubtedly has come from the fact that a few cases of smallpox have occurred in the State, requiring the immunization of a large number of contacts.

(e) *Typhoid-Paratyphoid Vaccine.*—The amount of this product distributed approximates the high record made in 1927 and represents a general demand rather than the special demand caused by the various floods in 1927.

(f) *Schick Outfits.*—In spite of the fact that preliminary Schick tests are now being largely abandoned in diphtheria prevention campaigns, the number of outfits distributed remains about the same. It would seem that although fewer outfits are being used in school campaigns, more are being used by private practitioners.

(g) *Diphtheria Toxin-Antitoxin Mixture*. — There has been a gratifying increase in the demand for this product — the amount put out in 1928 being the largest ever distributed.

(h) *Scarlet Fever Streptococcus Antitoxin*. — The demand for this antitoxin still continues although the amount distributed in 1928 is somewhat less than that distributed in 1927. This undoubtedly has been due to the lower incidence of the disease. Reports received from physicians and from hospitals continue to show that this product is of value in the treatment of scarlet fever. All our experience, so far, only confirms our opinion, that except in special cases, there are more disadvantages than advantages attending the use of this antitoxin for prophylaxis.

(i) *Normal Serum*. — The increased demand for normal serum for experimental purposes still continues, and in addition to this product large amounts of horse red blood corpuscles, whole blood and blood clots, which are waste products, have been distributed to investigators in various medical schools and other laboratories in the State.

(j) *Silver Nitrate Ampoules*. — All ampoules distributed by the State during the past year have been manufactured in this laboratory and the distribution remains about constant.

(k) *Anti-Measles-Diplococcus Serum*. — This serum which was developed in 1927 is still being sent out for investigative purposes only.

3. Expenses.

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1924	\$41,000 00	\$40,983 18	\$34,065 81	\$33,900 28	\$75,065 81	\$74,883 46
1925	43,200 00	42,507 56	34,648 52	33,342 18	77,848 52	75,849 74
1926	46,000 00	45,025 29	31,184 94	30,747 71	77,184 94	75,773 00
1927	50,355 00	50,261 54	34,611 11	34,579 87	84,966 11	84,841 41
1927 ¹	—	—	29,500 00	29,488 68	29,500 00	29,488 68
1928	59,000 00	58,919 08	38,005 37	37,955 34	97,005 37	96,874 42

¹ Special appropriation for purchase and installation of equipment.

The increased appropriation for personal services represents the very gratifying salary increases granted during the year to many of the employees. Those in the lower grades are now adequately paid and with the larger salaries prevailing it is possible to select more highly qualified workers, and to retain the services of the well trained and faithful members of the staff. The salaries paid professional members of the staff are still too low and the standards set during the recent classification are not sufficiently high to make it possible to retain in the organization the highly trained and experienced chemists and bacteriologists who are necessary for the proper functioning of the laboratory. It is hoped that the maximum limits for these higher grades may be raised. The increase for expenses was necessitated by the full year's operation of the larger laboratory and stable space. The appropriation was just sufficient to cover the operating expenses. The appropriation would not have been sufficient had not a special effort been made to effect new economies. The purchase of many supplies which were required in large quantities has been restudied and appreciable savings effected.

4. Improvements.

(a) The continued study of the various factors involved in the purification and concentration of antitoxin has resulted in more highly purified lots of diphtheria antitoxin and of scarlet fever streptococcus antitoxin. These products can now be so prepared that the solutions not only are clear but remain clear and the prevention of sediment formation does away largely with undesirable reactions following their administration.

(b) The method for concentrating and refining antipneumococcic serum has been studied with Dr. Felton of the Harvard Medical School and three lots of this antibody solution have been prepared. These lots on test have been found to have a most satisfactory potency for Type I pneumococcus and their use in treat-

ment has already given gratifying results. This refined serum appears to be therapeutically active and so far it has not produced any reactions in persons treated with it. The horses already under immunization with Type I pneumococcus are now being immunized with Type II pneumococcus and two new horses are being immunized with Type I pneumococcus alone and two with Type II. It is hoped, therefore, that in the coming year it will be possible to distribute concentrated pneumococcus antibody solution potent for both Types I and II pneumococcus.

(c) In addition to the usual toxicity tests on diphtheria toxin-antitoxin mixture, tests are now carried out to determine the immunizing potency of all lots of this product. This change has been made because experience has shown that the toxicity test alone is not a reliable measure of the immunizing value of any preparation. Several earlier lots which were produced in 1926 and early in 1927 showed a most disappointing immunizing effect in various groups in the Commonwealth. The cause of these results was found to lie in one phase of the method used in preparing this product. With an improvement in the method of preparation and with a routine application of the test for immunizing value, there should be great improvement in the percentage of persons rendered immune by the preparations that are now being distributed.

(d) With the improved method of concentration and the longer storage of scarlet fever streptococcus antitoxin that is now possible, this antitoxin now produces a lower percentage of cases of serum sickness than formerly caused by the earlier and younger lots.

(e) Various changes in some of the processes and the installation of new apparatus have led to improvements which not only save time and labor, but result in a still higher standard of the products distributed.

5. *Personnel.*

There have been no important changes in the personnel of the laboratory. With the higher salaries paid, the labor turnover has been decreased and in spite of increased work, no additional employees have been added to the staff. The personnel at present is made up as follows: 1 Director, 1 Assistant Director, 2 Senior Bacteriologists, 1 Assistant Bacteriologist, 1 Junior Bacteriologist, 1 Senior Chemist, 1 Assistant Chemist, 1 Principal Clerk and Stenographer, 1 Junior Clerk and Stenographer, 1 Senior Clerk, 3 Laboratory Assistants, 9 Laboratory Helpers, 13 Laborers, 2 Janitors, 1 Stable Foreman — 39 in all.

6. *Reclassification.*

A year's experience with the new classification of personnel has shown that so far as grades are concerned, the classification fits well with the positions. The salary ranges are satisfactory for the lower grades, but as already mentioned they are too low for the members of the professional staff.

7. *Educational Activities.*

In addition to the regular course in Applied Immunology given in connection with the Harvard School of Public Health, 23 demonstrations have been given to classes of medical students, nurses, teachers and school students. Large classes from the three medical schools of Boston, of nurses from Simmons College, Massachusetts General Hospital, Waltham Hospital, Quincy Hospital, Melrose Hospital, Peter Bent Brigham Hospital, Lowell Hospital, Massachusetts Homeopathic Hospital, Newton Hospital, Somerville Hospital and the Malden Hospital have been shown the various processes required in the making of biologic products. The cooperation of this laboratory with Simmons College in the training of laboratory technicians has also been continued and during the year two students have completed the course. This opportunity is being more and more eagerly sought for and it has become necessary to limit the number of students taking this course. Three students from foreign countries have spent varying lengths of time studying laboratory administration and the methods of preparing and testing serums and vaccines.

8. *Lectures and Addresses.*

The Director and the Assistant Director have as usual participated in the course of Immunology at the Harvard Medical School and in the course for Public Health students at the Massachusetts Institute of Technology. They also have given addresses before meetings of medical societies and other organizations. In addition to these activities, the laboratory is yearly attracting more and more visitors from foreign countries. Various scientists, public health workers and others from Belgium, Bulgaria, Canada, China, Colombia, Costa Rica, Hungary, India, Italy, Japan, Poland, Rumania and Spain have visited the laboratory during the past year.

9. *Investigations.*

(a) The study of the phenomenon of the dissociation of toxin in frozen toxin-antitoxin mixtures has been completed and the results are already published. The study shows that mixtures of the 1 L₊ type show such dissociation on prolonged exposure to low temperatures but that the 3 L₊ mixtures, and the 1/10th L₊ mixtures now being distributed show no such dissociation upon prolonged freezing.

(b) A study is being made of various diluents for diphtheria toxin in the hope that it may be possible to send out the toxin in the Schick test outfit already diluted in the proper proportion. The results so far would seem to show that the method tried is suitable. If further investigation confirms the early results, it will be possible to distribute a Schick outfit containing only two vials—one of diluted toxin and one of diluted heated toxin. Such an outfit would not only effect a great saving in cost of preparation but would be far more convenient for the person using the outfit.

(c) A series of experiments has been carried out to determine the effect of different grades of glass upon the potency of biologic products. These experiments so far seem to show that cheaper grades of glass than are now used may be employed for certain products. The substitution, therefore, of cheaper vials will effect a considerable saving.

(d) The study is being made of the phenomenon of flocculation which occurs in mixtures of diphtheria toxin and antitoxin. This method is now used for the preliminary titration of toxins and of antitoxins and effects a considerable saving in the number of guinea pigs required.

(e) All horses before being placed upon diphtheria immunization are now tested for natural diphtheria antitoxin and records are being kept of the immunity response to toxin injections of animals originally showing varying degrees of natural immunity.

(f) Experiments have been and are now being made on the chemical concentration of diphtheria toxin. The purpose of this study is to determine if it is possible not only to concentrate diphtheria toxin but to free it from the protein of the diphtheria bacillus. The results so far are most encouraging and it seems likely that we may be able to concentrate all diphtheria toxin produced and thus save considerable expense for containers and for storage. In connection with this study, experiments are being continued on the production of diphtheria toxoid, but as yet it does not seem desirable to distribute this product for general use.

(g) A bacteriological study has been made of the various organisms isolated during the epidemic of septic sore throat which occurred in Lee in July. Approximately 75 strains of hemolytic streptococci isolated from the throats, the ears and the blood of persons suffering from septic sore throat and from the milk of a cow suffering from mastitis have been thoroughly studied. The organisms isolated from typical cases and from the milk of the one infected cow were found to be identical and can be classed as *Streptococcus epidemicus*. In connection with this work the cow that apparently caused the epidemic was brought to the laboratory and the course of the infection in the udder was followed for two months. This cow continued to show large numbers of hemolytic streptococci of the *Epidemicus* type in the milk from two quarters, but the most important observation made was that this type of streptococcus can be present in large numbers in the milk of a quarter without either the milk or the quarter showing any gross signs

of infection. Another cow has been purchased and experiments have been begun on the power of various hemolytic streptococci to invade and multiply in the milk ducts of a healthy cow.

(h) In conjunction with the Bussey Institution for Applied Biology of Harvard University, a graduate student is studying the inheritance of resistance in the rat to paratyphoid infection.

(i) In addition to these studies Dr. James Gamble of the Harvard Medical School and Professor Dill and his associates of the Department of Bio-Chemistry of Harvard University have made a series of observations of the acid-base relations in the blood of normal horses and horses under immunization and of oxygen-carbon dioxide relations existing in normal horses and horses under immunization.

10. Publications.

The following papers have been published:

Clarence L. Scamman and Benjamin White: Active Immunization against Diphtheria. Present Day Methods and Recommendations. N. E. Journal of Medicine, Vol. 198, No. 16, pp. 839-841, June 7, 1928.

Elliott S. Robinson and Benjamin White: Effect of Exposure to Low Temperatures on Diphtheria Toxin-Antitoxin Mixtures. Second Communication. Journal of Immunology, Vol. XV, No. 4, pp. 381-394, July, 1928.

Benjamin White: Serums and Vaccines in the Prevention and Treatment of Infectious Diseases — A Critical Review. N. E. Journal of Medicine, Vol. 199, No. 11, pp. 505-513, September 13, 1928.

11. Inspection.

Dr. George W. McCoy, Director of the Hygienic Laboratory of the U. S. Public Health Service made his usual annual inspection of this laboratory on November 20. The license to manufacture and sell biologic products issued by the United States Public Health Service was continued.

II. WASSERMANN LABORATORY.

WILLIAM A. HINTON, M.D., *Chief of Laboratory.*

1. Tests and Examinations.

	1924.	1925.	1926.	1927.	1928.
Wassermann Tests	60,534	62,695	64,665	67,699	75,471
Kahn Tests	2,554	2,729	1,302	2,644	2,692
Gonococcus Fixation Tests	1,661	1,903	1,776	1,409	1,860
Lange's Colloidal Gold Tests	88	33	25	35	27
Complement Fixation Tests for Glanders	—	50	27	15	37
Specimens of Milk Examined for Tuberculosis	—	—	—	46	21
Complement Fixation Tests for Antimeningococcic Serum	—	—	79	—	—
Diagnostic Examinations for the Division of Animal Industry:					
(a) Complement Fixation Tests for Glanders	110	42	43	33	44
(b) Examinations for Rabies	283	282	312	510	546
(c) Pathologic and Bacteriologic Examinations	18	24	18	20	24
(d) Agglutination Tests for Bacillus Abortus	148	89	101	282	822
Diagnostic Examinations for Lakeville State Sanatorium	—	—	—	—	5
	65,396	67,847	68,348	72,693	81,549

It will be seen that the continuous increase in the number of Wassermann tests done was proportionately greater in 1928 than in the previous five years. The number of examinations for rabies also constitutes another high record — the larger number of examinations done reflecting the increased prevalence of the disease in the State. The very large increase in the number of agglutination tests for *Bacillus abortus* shows the growing interest in this disease. Altogether the tests show a 12.2 per cent increase over those of the previous year. On the basis of a test as a unit of output, the cost per test in 1927 was 24.5 cents and in 1928 was 23 cents. This reduction in cost per test has been accomplished with the same personnel. It has become evident that the peak of this laboratory's output has been reached with its present personnel. There is no longer an adequate factor of safety for the proper conduct of the work — the bulk of which must be completed on the day on which it is begun. Provision, therefore, should be made in the

budget of the coming year for the employment of an additional full time assistant of the Laboratory Helper grade at a beginning salary of \$900 per year.

A new activity consists in the making of pathological examinations of tissues and other material from the Lakeville State Sanatorium.

2. Expenses.

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1924	\$11,800 00	\$11,689 70	\$6,000 00	\$5,827 65	\$17,800 00	\$17,517 35
1925	12,500 00	11,984 70	6,000 00	5,971 18	18,500 00	17,955 88
1926	12,600 00	12,186 98	5,500 00	5,386 40	18,100 00	17,573 38
1927	12,616 00	12,506 91	5,300 00	5,068 66	17,916 00	17,575 57
1928	14,000 00	13,723 34	5,182 25	5,094 01	19,182 25	18,817 35

One of the most significant accomplishments of the year is the performance of the increased number of tests (12.2 per cent) with an expenditure of practically the same amount of money for expenses. This very economical operation has been made possible by the fact that more adequate salaries have been paid. Following the reclassification of personnel, the increases in the amount of money spent for personal services was only \$1,200. It would, therefore, seem that the better compensation of the employees has resulted in far greater efficiency of the work and in actual saving of money on the expense account.

3. Investigations.

In addition to these routine activities, many tests, both practical and experimental, have been made with Hinton's Glycerol-Cholesterol Agglutination reaction for syphilis. These reactions have been done on selected institutional groups with the hope of finding the value of the reaction in syphilis, as well as its limitations (if there be any) in the presence of other diseases which might influence its accuracy, before recommending its substitution by the Department of Health for the Wassermann test which is more expensive and less accurate, as indicated below.

Comparative studies elsewhere have appeared to demonstrate that this reaction is superior to the Wassermann or the Kahn, not only in the diagnosis of syphilis but also as a guide in the treatment of the disease. The reaction has already been adopted as a routine procedure in the Massachusetts General Hospital and the Boston Dispensary. A number of other institutions in Boston and elsewhere are now using it, either on a practical or on a trial basis.

4. Teaching.

As in previous years this laboratory has been used for teaching purposes, both in the Harvard Medical School and the School of Public Health and it has also received students from Simmons College for training in serology.

REPORT OF DIVISION OF HYGIENE

MERRILL CHAMPION, M.D., *Director*

The annual report of the Division of Hygiene for the fiscal year ending November 30, 1928 — the eleventh and last to be written by the present Director of the Division — follows. It will be discussed according to the following outline:

- I. A Statement of the Scope of the Division's Work.
- II. Personnel of the Division.
- III. Appropriation for the Fiscal Year 1927-1928.
- IV. Discussion of the Activities of the Various Sections:
 1. *Maternal, Infant and Preschool Hygiene:*
 - (a) Well Child Conferences.
 - (b) Summer Round-up.
 2. *Public Health Nursing:*
 - (a) Duties of the Nursing Consultants.
 - (b) Group Meetings.
 3. *School Hygiene:*
 - (a) Surveys.
 - (b) School Hygiene Conferences.
 - (c) Normal School Project.
 - (d) Continuation School Project.
 4. *Nutrition:*
 - (a) Consultation.
 - (b) Teaching.
 - (c) Ten-Year Program Work including Follow-up.
 - (d) Summer Health Camps.
 5. *Dental Hygiene:*
 - (a) Advisory Committee in Dental Hygiene.
 - (b) Regional Consultants.
 - (c) Massachusetts Association of School Dental Workers.
 - (d) State-wide Dental Campaign Program.
 - (e) Local Developments.
 - (f) Consulting Service.
 6. *Health Education:*
 - (a) General activities.
 - Pamphlets.
 - Baby and You.
 - Prenatal and Postnatal Letters.
 - Publicity.
 - The Commonhealth.
 - Art Correlations.
 - Lectures.
 - (b) Special activities.
- V. Certain Special Projects of the Division:
 1. Local Child Health Committees.
 2. May Day — Child Health Day.
 3. Summer Round-up.
 4. Franklin County Demonstration.
 5. The Summer School at Hyannis.
 6. A Study of Summer Camp Children.
 7. A Continuation School Study.
 8. A Study of a Group of Stillbirths.
- VI. Recommendations.

I. THE SCOPE OF THE DIVISION'S WORK.

The Division of Hygiene as at present constituted includes within the scope of its activities child hygiene in the broad sense of the word, public health nursing, health education, school hygiene and the specialties of nutrition and mouth hygiene. In addition to these it has charge of the editing of the Department's pub-

lication, The Commonwealth, and of the annual reports, as well as the various educational pamphlets prepared by the Department.

II. PERSONNEL OF THE DIVISION.

The Division personnel consists of a Director; two pediatricians; four public health nursing consultants; one school nursing consultant; a consultant in nutrition with four assistant nutritionists; a consultant in mouth hygiene; a health education worker in charge of Child Health Day and the Summer Round-up activities, publicity and exhibits; this worker also serves as nutritionist on the demonstration pre-school conferences. The Division also has another health education worker engaged in promoting the correlation of health education with the teaching of art in the public schools. The office staff consists of a principal clerk and stenographer, one senior clerk, two senior clerks and stenographers, four junior clerks and stenographers, two junior clerks and typists, and a junior messenger.

III. APPROPRIATION FOR THE FISCAL YEAR 1927-1928.

Division of Hygiene.

	Services.	Expenses.
Appropriation	\$31,375 00	\$16,500 00
1927, brought forward	—	34 80
Credits	—	21 29
		<hr/>
		\$16,556 09
Expended to date	31,019 68	16,501 14
	<hr/>	<hr/>
	\$355 32	\$54 95

Maternal and Child Hygiene.

	Services.	Expenses.
Appropriation	\$20,000 00	\$10,400 00
1927, brought forward	—	2 10
Credits	—	1 64
		<hr/>
		\$10,403 74
Expended to date	19,248 33	10,403 42
	<hr/>	<hr/>
	\$751 67	\$0 32

IV. DISCUSSION OF THE ACTIVITIES OF THE VARIOUS SECTIONS.

1. Maternal, Infant and Preschool Hygiene.

(a) *Well Child Conferences.*

Those regularly participating in these activities are a pediatrician, in immediate charge of the work, the four public health nursing consultants, the nutritionist to the conference, and the other specialists as there is need. Setting aside for the moment the part played by public health nursing, the main channel through which the preschool work is carried on, is the demonstration well-child conferences. These conferences are held in various communities in the State, chiefly the smaller ones, at the request of some responsible agency. Their purpose is to interest the parents in the health of their younger children through the means of a health examination. The other object of these conferences is to encourage communities which may properly have need of a well-child conference to establish one for themselves. Great care is taken by all connected with these conferences not to suggest treatment for the children. Reference is invariably made to the family physician and dentist.

During the past year there were 42 such conferences in 38 towns, held throughout the State, 27 of which were in Franklin County in 24 towns. The total number of children examined throughout the State was 1,906. A special demonstration is being carried on for several successive years in Franklin County to see what effect can be shown over a period of years through the examination of as many children as possible with intensive effort to encourage the establishment of good health habits on the part of the children.

There were 1,291 pre-school children examined in Franklin County, the attendance averaging 48 to a conference. An interesting fact was that 133 of these children were about to enter school for the first time in the fall. The examination of these children therefore, constituted in essence a Summer Round-up, reference to which will be found later in the report.

Many facts of interest are brought out by these conferences in small, isolated towns. The chief one is the urgent need of more public health nursing service, looking towards the promotion of better health habits amongst the families of the towns. In a series of 889 cases the nutritionist attached to the well-child conference studied the recommendations made to see what were the outstanding needs found. It was seen that the problem of the child's teeth had to come in for the greater part of the attention. These mothers were instructed in the value of the early care of the teeth, the importance of the first teeth, the location and the significance of the six-year molar, and the care of the gums. The next point to be stressed in order of frequency was the need of dark bread in the diet. After that came "two vegetables a day, at least one besides potato or potato substitute." Following this in order of frequency came the stressing of daily rest, a proper breakfast, and no eating between meals. A curious fact was that in the small towns the need for instruction seemed to be along the line of better care of the teeth, the use of dark bread, more frequent use of vegetables, whereas in the larger towns it was necessary to stress less candy, more milk, and more daily rest.

It should be remarked that the family physician receives in every instance a copy of the findings of the physician in charge of the well-child conference and the family is urged to talk the matter over with its physician. Furthermore, the nutritional report of each well-child conference is sent to the local nurse to aid her in her follow-up. She is especially urged to pay attention to the underweights amongst the group. A most worth-while contact has been established with the specialist in nutrition of the State Agricultural Extension Service, to enable her to cooperate by directing the nutritional projects of the Home Demonstration Agents towards meeting some of the needs in the different towns discovered through the well-child conferences.

It is quite evident from a study of these conferences that they serve as an excellent means of approach to the town and their effect is felt long after the State group has gone. We are finding it rather difficult to get adequate follow-up reports from these conferences, the reason being largely that the local nurses have so much to do that they find it hard to do the follow-up and report it as well. It goes without saying that we should prefer to have the follow-up to the report of the follow-up, if there had to be a choice, but are in hopes that it will be possible in the future to get both.

It is interesting to try to determine what results are being obtained from the well-child conferences. These conferences were begun in 1924 and have been held in 181 towns since then. In 23 of these towns there is now a permanent well-child conference with a physician in charge. In 17 other towns there is a weighing and measuring clinic with a local nurse in charge. While the Department cannot take all the credit for the establishing of these local conferences, there is little doubt but that the stimulus of the outsider going in with a demonstration is the main factor in crystallizing public opinion in favor of local action.

There are other results which are perhaps less definite but equally important. These are listed by the Well-Child Conference Physician as follows: More interest in May Day as Child Health Day; increased demand for talks on Child Hygiene; more interest in getting a larger measure of public health nursing service for the town; an increased interest in correcting children's defects early and the establishment of facilities for the examination of children about to enter school for the first time in the fall. A further result of incalculable importance is the slow but steadily growing appreciation amongst local physicians of the part that prevention is likely to play in the future of the practice of medicine, particularly in pediatrics and obstetrics.

(b) *The Summer Round-up.*

Reference has been made above to the fact that one by-product of the Well-Child Conference is greater interest in the examination of the children about to

enter school for the first time in the fall. This has possibilities which are not yet fully recognized. It is not beyond the bounds of reasonable expectation that if the family physician can be interested in giving a health examination to the child who is about to enter school in the fall he may come to appreciate more fully the desirability of such service for all children including those of school age. When that time comes we shall have less of a problem in the medical supervision of our school child. The present somewhat cumbersome machinery may perhaps be then susceptible of modification.

2. Public Health Nursing.

(a) Duties of the Nursing Consultants.

The outstanding function of the four public health nursing consultants of the Division of Hygiene is to get into helpful touch with the 1,100 or more local public health nurses scattered throughout the length and breadth of Massachusetts. This in itself is a huge undertaking. The work could be much more adequately done if there were five or six such consultants instead of four. None the less, when a review is made at the end of the year of the contacts which have been established, and the stimulation given to better service, it is realized that it is in this way that we can most reasonably hope to raise slowly but surely the standards of public health nursing in the State. Infinite details might be given, of course, of the ways in which this stimulation of local activity is carried out. It will suffice to say, however, that there is no phase of public health nursing in the towns of the State which does not finally come to the attention of these Nursing Consultants. Serving as advisors and not supervisors, they are able to have the sort of approach which would be denied those coming with demands rather than suggestions. The result is that when local activity is initiated there is complete community backing for it which might be in part or entirely lacking if too much were due to compulsion on the part of the State.

(b) Group Meetings.

In addition to the individual contact between Public Health Nursing Consultants and local nurses, there is the group contact which comes from the holding of meetings in various sections of the State. For example, in one district the Public Health Nursing Consultant cooperated with the County Public Health Nursing Association in promoting monthly meetings for the nurses of the district.

It may be said that the Public Health Nursing Consultants of the Division serve as the generalists whose function it is to transmute into action the suggestions of the various specialists.

3. School Hygiene.

Massachusetts has a compulsory school hygiene law which calls for the services of a school physician and a school nurse in all the municipalities of the State. There are no definite statutory standards for this service. An indirect standard is established by reason of law that the State Department of Education after consultation with the State Department of Public Health, may prescribe record forms for carrying out the examinations which the local school physicians are expected to conduct. The responsibility then rests largely upon the local authorities to do a good job. They can meet this responsibility to better advantage if there is advisory assistance on the part of the State. It is one of the functions of the Division of Hygiene to furnish such advisory assistance.

(a) Surveys.

No community can decide how adequate this school health service is without some sort of survey, made either locally or through an outside agency. For the last couple of years the Division of Hygiene has been offering to local communities the services of our school physician and school nursing consultant who will go into the community and make a first-hand study of existing conditions with a view to recommendations for extension or improvement. There were five surveys made during the year, two of which were in cities, and one a resurvey.

The school hygiene activities have been hampered to a considerable extent during the past year by the fact that a vacancy has existed in the position of School

Nursing Consultant. Our four Public Health Nursing Consultants, as part of their duties, make frequent contacts with the local school nurses but it is the function of the School Nursing Consultant to stimulate special projects and to give more assistance to local school nurses and their problems than would be possible through the other consultants, busied with many and varied health activities.

(b) School Hygiene Conferences.

Whatever method may be used to make contact with local workers, the group method should never be overlooked. For the past seven years a series of school hygiene conferences has been carried on under the joint auspices of the State Department of Public Health and the State Department of Education. These, aimed primarily at the school nurse, have interested and attracted the school physicians, school superintendents, dental hygiene workers, and even members of school committees and other interested persons. There is no question that in this way it has been possible slowly to raise the standard of school nursing throughout the Commonwealth. School nurses are stimulated and encouraged to do better work and are given the latest information along various lines of public health work while the school superintendents are encouraged to demand higher standards on the part of those whom they employ to do school nursing. The series this year dealt with the board subject of nutrition and the allied subject of dental hygiene. Five such conferences were held in various parts of the State — in each case, with one exception, in the State Normal School. The attendance was 359.

(c) Normal School Project.

Certain special projects have been carried on from time to time in the school hygiene field. For several years considerable time has been devoted by the physician in charge of school hygiene to the development in one of the State Normal Schools of a school health program which may serve as a model for other normal schools.

(d) Continuation School Project.

It was hoped that it might be possible to have started last year a study of the health of the children in continuation schools. The State requires that children going to work at the age of fourteen receive certain educational advantages until they reach the age of sixteen. Ordinarily less attention is paid to the supervision of the health of these children than is paid to that of the children who are pursuing their education under the more usual method. It would be interesting and valuable to know what effect work has upon children of this age.

It was found, however, that in order to make such a study in a sound fashion much more time and personnel would be required than would be advisable at present. In all probability such a specialized research ought really be the province of a privately financed agency.

4. Nutrition.

(a) Consultation.

The work of the section on nutrition extends largely in three different directions. The first has to do with consultations with local communities having nutritional problems. This is not so great at present as it will be when there are more nutritionists employed by local agencies, both official and voluntary.

(b) Teaching.

Then there is the need of offering facilities to nurses and school teachers to obtain in concentrated form a somewhat greater knowledge of the principles underlying nutrition of children than they now possess. A series of from three to six lectures was given in five different places during the past year, the groups reached being nurses or teachers.

(c) Ten-Year Program Work including Follow-up.

The third line of activity is that in connection with the so-called Ten-Year Program for the prevention of juvenile tuberculosis. Four assistant nutritionists, employed and supervised by the Division of Hygiene, are loaned to the Division of Tuberculosis for this work. While on the clinic they are under the direct super-

vision of the chief of the clinic. The Consultant in Nutrition of the Division of Hygiene, however, is responsible for the content of their teaching and, of course, for their activities during the time when they are not on the clinic. It is the function of these clinic nutritionists to try to diagnose the faults in the health habits of the children who come to the clinic for examination and to advise with the parents of the children as to how these health habits may be improved to the end that general health standards be raised. The clinics referred to above were held in 20 towns of the State. The nutritionists held conferences with and made recommendations for 7,825 children of whom 6,494 were accompanied by a parent.

(d) *Summer Health Camps.*

One other activity of the nutritionists which has come to be an annual affair is the visiting of summer health camps. Many of these appreciate the looking over with suggestions as to better handling of nutritional problems.

5. Dental Hygiene.

The Division has at last a comprehensive dental hygiene program in full swing. This will be discussed in considerable detail as exemplifying the principles on which the Division has worked in every field.

(a) *Dental Advisory Committee.*

The organization of dental hygiene in Massachusetts has become highly centralized as the Dental Advisory Committee has been enlarged to include representatives of every group in the State interested in dental public health work. This organization can be represented as follows:

Massachusetts Department of Public Health.

Dental Advisory Committee:

President, Massachusetts Dental Hygiene Council.

Massachusetts Dental Society:

President.

Chairman, Public Health Committee.

Six Regional Consultants.

President, Massachusetts Association of School Dental Workers.

President, Massachusetts Association of Dental Hygienists.

Director, Forsyth Dental Infirmary.

Dean, Harvard Dental School.

Dean, Tufts Dental School.

Two Specialists in Children's Dentistry.

This Committee makes for close cooperation and unified effort among the different groups anxious to promote dental health.

Meetings of this Committee are called every few months by the Commissioner of Public Health. The Committee discusses new projects, helps the Department plan state-wide programs, advises concerning matters of dental policy, and endorses dental educational material. Its members relay information concerning the dental program of the Department to their respective organizations.

(b) *Regional Dental Consultants.*

Six dentists recommended by the Massachusetts Dental Society have been appointed as Regional Consultants to the Department in the six health districts of the State. These consultants interpret state programs and policies to the dental profession in each district and stimulate community dental programs when possible.

(c) *Massachusetts Association of School Dental Workers.*

This Association was formed in February, 1928, under the auspices of the Department and the Advisory Committee to promote better community dental programs. Its present membership of 353 includes approximately 220 school dentists, 54 dental hygienists, and 79 dental assistants (including some school nurses).

Its organization includes a chairman and secretary from each of the six districts besides the regular officers. District meetings are held in the fall; the annual

meeting in May. The Dental Consultant of the Department is secretary and editor of the Monthly Bulletin, ex officio. This Bulletin gives the Department a splendid contact with this large group of field workers.

(d) *State-wide Dental Campaign Program.*

A campaign to clean up existing dental defects by interesting school children in working for Dental Certificates (cards stating that all necessary dental work has been completed) was launched as part of the May Day program.

Two hundred communities ordered campaign material. Seventy-eight communities reported the number of certificates awarded. The dental certificate will be the basis of every community program for the correction of dental defects and the annual reports which the Department will publish from year to year.

(e) *Local Developments.*

A large majority of the dental clinics in Massachusetts are now concentrating on the younger children as recommended in the Dental Policy of this Department. Several communities are establishing dental service for preschool children.

The number of dental hygienists employed in the communities has increased 34 per cent in the last year.

(f) *Consulting Service.*

Our Dental Hygiene Consultant now offers the following types of service:

- | | | |
|----------------------|---|--|
| To all communities | { | 1. Organization of dental campaigns. |
| | | 2. Dental clinics: |
| | | Organization. |
| | | Preventive policy. |
| | | Practical details of management. |
| To dental hygienists | { | 3. Help in — |
| | | Planning school and community programs. |
| | | Preparing material for teaching dental hygiene. |
| | | Finding positions in schools (registry service). |

A large part of our Consultant's program is carried out through the cooperation of the following:

- 4 public health nursing consultants.
- 9 members of Dental Advisory Committee.
- 6 Regional Consultants.
- 12 District Chairmen and Secretaries, Massachusetts Association of School Dental Workers.
- 4 members of Executive Committee, Massachusetts Association of School Dental Workers.

A postgraduate course for dental hygienists was held last summer at Hyannis Normal School. The course includes work in School Dental Procedures, General Public Health Methods, and Teaching Methods Applied to Health Subjects.

Legislation is being suggested this year that will enable school committees to employ dental hygienists.

An outline of a program for dental hygienists who may be employed by the school department has been added to the Dental Policy of this Department.

6. Health Education and Publicity.

(a) *General Activities.*

It is the function of this section of the Division to interpret the work of the whole Division to the public in understandable terms. This is done through the use of pamphlets, exhibits, posters, motion pictures, delineascope films, and letters. Every cooperation is offered national health agencies in nation-wide drives.

During the past year the printing of our various pamphlets totalled 2,249,280 copies. This represents very little over a year's supply. A new edition of *The Baby and You* was brought out this year. This pamphlet has been largely rewritten and supplied with new illustrations. Our prenatal and postnatal letters have been continued as for some years past. We carry on our registry approxi-

mately 4,996 prospective mothers and 12,291 mothers of babies under two years of age, who receive these letters monthly. In May we began sending out our first Letter to Fathers, when requests were received from the prospective mothers, and have sent 2,754 such letters during that period.

News releases and brief, simply written articles on health topics have been sent at intervals to various local newspapers.

The usual four issues of *The Commonwealth* have appeared. They were specially devoted to the subjects of Rabies, Venereal Diseases, Sanitation and Nutrition.

The project which was started some two years ago of having the Division artist reach the local supervisors of art in the public schools has been continued. By the use of health slogans an excellent approach has been made to the correlation of health habit promotion with instruction in drawing. An important by-product of this contact has been the distribution of the Department's health pamphlets through the teachers to the school children. About three-quarters of a million leaflets were sent in this way to teachers last year, the requests coming from the teachers themselves and being specific as to leaflets wanted and number.

Nearly two-thirds of the towns of the State were visited last year in promoting this project.

During the year 562 lectures were given by the Department in 138 communities, by 48 speakers, to audiences aggregating 35,380 persons.

(b) Special Activities.

Several of these, such as Child Health Day and the Summer Round-up, will be included under the heading to follow.

V. CERTAIN SPECIAL PROJECTS OF THE DIVISION.

1. Local Child Health Committees.

During the past year further progress has been made in getting child health committees started in the various towns of the State. This, naturally, is a slow process, representing as it does the ideal type of organization. It is hoped that by this means a strong body of local opinion may be built up which will further all types of necessary child health activities. It is an undeniable fact that projects taken over by local communities as their own can prosper much better than if they have an *ex cathedra* flavor. But if communities are to take over such projects there must be a local, and widely representative, agency accessible. If within five years such a committee is firmly established in the majority of towns, it will be a matter for congratulation.

As an indication of progress toward this end one of our Public Health Nursing Consultants reports that out of her 103 towns there are now 63 with Child Health Chairmen: "60 are in such condition that we could go to them for help in furthering plans for child health work."

2. May Day — Child Health Day.

This national movement has been successfully incorporated into the Massachusetts plan for child health. Local child health committees have been interested; the physical education work of the public schools has been utilized; and the campaign for better teeth has been incorporated. Child Health Day is emphasized as a day on which to take stock of past health accomplishments and to plan for new ones.

Two hundred and thirty-three cities and towns held health day celebrations in their schools during 1928 with special emphasis on standard weight, good posture, clean, sound teeth, as evidences of health. Tags for being up to standard were distributed to 112,500 children. A notable fact is that fifty-three parochial schools in greater Boston participated in the Child Health Day activities.

3. Summer Round-up.

Figures as to the result of the drive made this year to get a physical examination for children entering school in the fall for the first time are not yet available. Many towns have made an excellent start in this direction; few are as yet taking advantage of the full possibilities of this movement. The implications of this attempt to take some of the burden off the schools and to interest families and physicians in the health examination of the child are many and far-reaching.

4. Franklin County Demonstration.

This has already been referred to in this report. Briefly, the purpose is to see what can be accomplished in the smaller towns in this rural county in the way of improving child health through demonstration conferences held several years in succession instead of only once as is the usual custom in relation to other towns. It is hoped that comparisons can later be instituted as a result of this policy. One thing is sure: great care is imperative if demonstration conferences of any kind are to be kept within bounds and not made an agency tending to lessen local responsibility.

5. The Summer School at Hyannis.

Few of the Division enterprises have greater possibilities than has this one. Teaching those who in turn will teach others is sound policy for a state health department. Attendance at these courses can be built up to a still higher degree through proper publicity.

Included last year were courses in School Nursing Procedures, Dental Hygiene Procedures, Nutrition, Social Service and Health Education Methods for Nurses and Dental Hygienists, and School Hygiene and Health Education for Teachers. Enrolled in these courses last summer were 32 nurses, 8 dental hygienists, and 21 teachers. Five nurses received the certificate which indicated attendance for three summers with the completion of at least six courses.

6. Study of Summer Camp Children.

One of the Division's nutritionists participated during the summer in a study of children enrolled in the Sunshine Camp, at Cambridge, maintained by the Cambridge Anti-Tuberculosis Association. This study is being continued throughout the winter by the Association alone. The purpose of the investigation is to help determine the true value of summer camps for children. It is obvious that if the children attending these camps do not show a permanent gain over those who are taken as a control group, the question may well be raised whether some more economical plan might not be found as a substitute for such camps. A report on this ought to be available next year.

7. Continuation School Study.

It was hoped that it might be possible to institute a study of children in the continuation schools in order to gather data as to the effect of work upon such children and also, incidentally, to see what sort of an end product we are turning out of our public schools from the point of view of health.

This project was reluctantly given up because of what it would cost to do a good job and also because of the possibility that the two-year period during which the working child is under supervision in the continuation school is not sufficient to produce demonstrable changes.

An inspection, however, made in certain continuation and regular schools resulted in the following suggestive observations:

1. "In the regular school there was a noticeable difference in nutrition, posture and vitality between the groups doing college preparatory work and the commercial and shop grades."

2. "The girls in the Continuation School showed very poor posture but otherwise compared favorably in nutrition and vitality with the girls of the commercial group in the grades and even with the college preparatory group."

3. "The boys in the Continuation School showed almost without exception poor posture, much malnutrition and poor vitality, or an appearance of weariness. They compared unfavorably with the Continuation School girls and with the grade school boys and girls."

More study would be necessary to answer the questions raised by these observations.

8. Study of a Group of Stillbirths.

In one city a series of 56 cases, supposedly stillbirths, was studied. Forty-eight of these were found to be properly classified while eight ought to have been listed

as neonatal deaths. In running down this relatively small group of cases 29 physicians and 2 hospitals were consulted.

Premature delivery seems to have been the basic fact in this series, although detailed figures are not yet available.

VI. RECOMMENDATIONS.

Certain recommendations seem called for as regards the work of the Division of Hygiene:

Nutritionist.

The full time services of a nutritionist are urgently needed for the Well Child Demonstration Conferences. Adequate attention to children of this age renders less necessary attention at a later age. Money can be spent most wisely and effectively on the younger children.

Dental Hygiene.

A well-rounded program is being pursued at present. There will soon be needed, however, an additional dental hygienist.

Health Education.

The promotion of the varied activities grouped under this head is becoming a larger problem every day, now that Child Health Day and the Summer Round-up are growing to such proportions. This section of the work ought not to have to share a worker with the Well Child Conferences.

Public Health Nursing.

It is very necessary that the vacancy in the position of School Nursing Consultant be filled as soon as possible with a competent worker.

The four nursing districts are too large as at present constituted. At least two of the districts should be divided.

REPORT OF DIVISION OF TUBERCULOSIS.SUMNER H. REMICK, M.D., *Director.*DAVID ZACKS, M.D., *Assistant Director.*HENRY D. CHADWICK, M.D., *Chief of Clinics.*

I have the honor to submit the ninth annual report of the Division of Tuberculosis. The report includes the activities of the Division from December 1, 1927, to November 30, 1928; a year which has shown marked progress in the hospitalization program. It is most gratifying to record that State, County and Municipal units have under construction, or have been authorized to construct, new buildings, or additions to provide 700 additional beds making a total of 4,300 beds for the entire State.

Few changes have occurred in the personnel of the Division during the year. In January Dr. Paul Wakefield was appointed Supervisor of Clinics. Dr. David Zacks, Acting Supervisor, resumed his duties as Assistant Director. The position of Tuberculosis Field Nurse in the Boston district was abolished June 1st.

SANATORIA.

The four State Sanatoria, Rutland, Westfield, North Reading and Lakeville have provided 383,471 days of treatment for 2,119 patients, representing an increase of 29,612 days of treatment over our 1927 record, and a decrease of 106 patients hospitalized. Necessarily the period of treatment for each individual hospitalized in 1928 was materially increased.

The gross weekly per capita cost is as follows: Rutland, \$16.22; Westfield, \$16.78; North Reading, \$17.92; Lakeville, \$20.09.

The Sanatoria are now being used exclusively for specialized service. Rutland is used for the care and treatment of adults in early or favorable stages of the disease, and is open to all citizens of the State. Westfield and North Reading are used exclusively for the hospitalization of children between the ages of 3 and 16 years. Both pulmonary and hilum cases are accepted. Lakeville is used exclusively for the hospitalization of non-pulmonary children and adults.

The institutions have not been able to meet the demand for service although the waiting list for Rutland is somewhat less pressing than a year ago. There has been a constant and increasing pressure for admission of patients at the other sanatoria. To meet this demand, special appropriations are being asked for in the current budget. A new children's building for Lakeville is greatly needed. At North Reading a new admission and isolation building is necessary, not only to increase its capacity but to have modern facilities for isolation to control contagious diseases. To this must be added the necessary buildings for the increased number of employees, and additions to power plants to supply the extra heat, light and power. The superintendents are to be congratulated upon the extremely satisfactory service their institutions have rendered during the past year. I feel that the pressing demand for hospitalization in the state sanatoria indicates the confidence the general public has in our institutions. The Superintendents and their staffs are responsible for this splendid achievement. To them I would express my appreciation.

For further information regarding the Sanatoria the reader is referred to the annual reports of the superintendents which follow.

PONDVILLE HOSPITAL.

This institution of 90 beds for the treatment of cancer was opened June 21, 1927. This hospital is placed in this Division particularly for administration purposes. During the past year the hospital has provided treatment for 555 patients and 174 of these were readmitted one or more times. The average length of residence in the hospital was 34.48 days. The gross weekly per capita cost was \$48.18. For the past few months the hospital has been filled to capacity and at present there is a waiting list. With the lack of facilities for the increasing Out-Patient Department and an anticipated continuing waiting list, I would recommend providing at least 25 additional single rooms with a modern Out-Patient Department on the ground floor.

The report of the Superintendent and of other members of the Department of Public Health on various phases of the cancer program will be found in another section of the Department's annual report.

TUBERCULOSIS DISPENSARIES.

All dispensaries have been visited one or more times. Milford is the only town that has discontinued service. The other towns, under 50,000 population, although not required by law to maintain this service unless requested by the Department, prefer to continue it. From observations made at time of visit and from reports received I believe that the dispensary service as a whole has shown very satisfactory improvement. Many of the larger communities are doing exceptionally good work. I have frequently stated that the local tuberculosis dispensary outfit is the most important agency in the State for the diagnosis and supervision of tuberculosis. As an aid to help bring this about I would suggest that all official workers, particularly the dispensary physicians and nurses, be brought together in some form of a permanent organization to meet one or more times a year to discuss ways and means of improving and making more uniform and intense the tuberculosis dispensary program throughout the State.

The standardization of method and procedure and the inspiration gained at such meetings enables the individual physician and nurse to give better service to the dispensary patients and to the community. Having this same thought in mind, the Division is planning to hold at least one nurses' conference at each of the four State Sanatoria during the coming year. These conferences with a well arranged program will, I hope, prove of value by giving the nurses an opportunity to see the State Sanatoria and the type of work they are doing.

FIELD WORK AND RECORDS.

The field work is now being carried on by four nurses. Since 1926 the personnel of this service has been reduced one-half with increased efficiency. A new code system to record findings and a statistical machine for sorting of records has made it possible for four nurses to do the work formerly done by eight. With the present force and system we will be able to make an annual check-up of all cases reported since 1915. Excluding Boston and Newton, the total number of cases investigated is 19,806; 18,201 of these were checked for follow-up and 1,605 were recently reported cases for which histories had to be obtained. There were 768 cases which were found to have moved and these were again referred to their communities for relocation.

The tuberculosis field nurses, besides checking and correcting the records of approximately 30,000 reported cases, are making a special effort to find out what is being done for the hilum and pulmonary cases discovered and reported by the Ten-Year Program Clinics. I feel that this phase of the Division's work has shown marked improvement during the past two years. The material is now available for statistical purposes. During the year a detailed analysis was made of some 1,300 children discharged from Westfield State Sanatorium since 1920. These studies again demonstrate the importance and value of good field work and accurate records.

THE TEN-YEAR PROGRAM.

The Clinic personnel now consists of twenty-one persons. This group is divided into two working units in the field and the necessary clerical force in the office. The main unit comprises five physicians, one nurse, three stenographers, three nutritionists, one advance field worker and an X-ray technician. The re-examination unit for follow-up work consists of one physician, one nurse and one nutritionist. Four stenographers and clerks at the office are engaged in writing reports and filing records.

During the first three years only certain selected children were examined. At the beginning of the fourth year all children in the grade schools, whose parents requested the service, were examined. Under this plan from 21 to 81 per cent, or an average of 60 per cent of the grade school children, have taken advantage of this opportunity to be examined. From a public health viewpoint the present plan of examining all school children is better for the community, as cases are not missed because of apparently good physical condition. The plan, however, re-

sults in the examination of a much smaller number of contact and underweight children. During the past four years clinics have been held in 238 cities and towns.

During the past year clinics have been held in 55 cities and towns, as follows: Aeton, Amesbury, Ashburnham, Ashby, Barre, Berlin, Blandford, Bolton, Boxborough, Brimfield, Brockton, Buckland, Charlemont, Easton, Essex, Georgetown, Granville, Hamilton, Hampden, Hardwick, Hawley, Heath, Hingham, Holden, Holland, Lancaster, Leicester, Lunenburg, Lynnfield, Millbury, Milton, Montgomery, Northborough, Oakham, Orange, Oxford, Paxton, Petersham, Phillipston, Quincy, Revere, Rowe, Royalston, Russell, Rutland, Shelburne, Spencer, Stoneham, Templeton, Tolland, Wales, Wellesley, Wenham, West Boylston and Winchester.

SUMMARY OF FOURTH YEAR'S EXAMINATIONS — NEW CLINICS.

Number of children examined	26,177
Number of contacts examined	913
Number given Von Pirquet test	26,052
Number of children with positive Von Pirquet (reactors)	7,219
Number of children X-rayed	7,909
Number of cases diagnosed as pulmonary tuberculosis	8
Number of cases diagnosed as hilum tuberculosis	376
Number of cases classified as suspects	896
Number of cases X-rayed and classified as negative	6,390
Number of children with enlarged or diseased tonsils and adenoids	7,135
Number of children with defective teeth	14,771
Number of children with heart murmurs	256
Number of cases of malnutrition	1,930

SUMMARY OF RE-EXAMINATION CLINICS.

Number of cities and towns where clinics were held	134
Number of children recommended for re-examination	4,807
Number of children re-examined	3,199
Number of children who refused re-examination	582
Number of children who were absent, moved away, left school	1,026
Number of pulmonary cases examined	31
Number of pulmonary cases found to be improved	11
Number of pulmonary cases found to be unimproved	20
Number of hilum cases examined	967
Number of hilum cases found to be improved	564
Number of hilum cases found to be unimproved	403
Number of suspicious cases examined	2,201
Number of suspicious cases found to be improved	1,245
Number of suspicious cases found to be unimproved	956
Number of negative cases examined	176
Number of negative cases found to be improved	97
Number of negative cases found to be unimproved	79
Number of new cases examined	101
Total number of examinations made	29,477

The total expenditure for the clinic service for 1928 amounted to \$56,653.70. The total number of examinations was 29,477. The cost for each examination per child was \$1.91.

SUMMARY OF FOUR YEARS' WORK.

	Dates.	Number of Children examined.	Number of Contacts examined.	Number given Tuberculin Tests.	Number of Reactors.	Per Cent of Reactors.	Number of Children X-rayed.	Number of Cases of Pulmonary Tuberculosis.	Per Cent of Pulmonary Cases of the Number given Test.	Number of Cases of Hilum Tuberculosis.	Per Cent of Hilum Cases of the Number given Test.
First Year	1924-1925	10,648	1,612	10,016	2,927	29	3,008	31	.31	561	5.6
Second Year	1925-1926	19,073	2,955	18,601	5,314	29	6,121	19	.1	621	3.3
Third Year	1926-1927	19,527	2,367	19,194	5,188	27	6,538	29	.1	524	2.7
Totals for First Three Years		49,248	6,934	47,811	13,429	28	15,467	79	.17	1,706	3.6
Fourth Year, 1927-1928 ¹		26,177	913	26,052	7,219	28	7,909	8	.03	376	1.4
Grand Totals		75,425	7,847	73,863	20,648	28	23,376	87	.12	2,082	2.8

	Dates.	Number of Cases classified as Suspects.	Per Cent of Suspects of the Number given Test.	Number of Cases of Ton- sils and Adenoids.	Per Cent of Ton- sil and Adenoid Cases of the Number of Children examined.	Number of Cases in Need of Dentistry.	Per Cent of Dental Cases of the Number of Children examined.	Number of Cases with Ab- normal Heart Sounds.	Per Cent of Heart Cases of the Number of Children examined.	Number of Cases of Mal- nutrition.	Per Cent of Mal- nutrition Cases of the Number of Children examined.
First Year	1924-1925	1,114	11	3,024	28	4,855	46	-	-	-	-
Second Year	1925-1926	1,399	7.5	3,652	19	8,575	45	398	2	-	-
Third Year	1926-1927	1,112	5.8	3,682	19	8,863	51	351	1.8	2,432	12
Totals for First Three Years		3,625	7.6	10,358	21	23,293	47	-	-	-	-
Fourth Year, 1927-1928 ¹		896	3.4	7,135	27	14,771	56	256	1	1,930	7
Grand Totals		4,521	6.1	17,493	23	38,064	50	-	-	-	-

¹ The first three years an attempt was made to examine the contact cases, the children who were 10 per cent or more underweight, and special cases who appeared to be in poor health. The fourth year all children were examined, without any attempt at selection.

COUNTY AND MUNICIPAL TUBERCULOSIS HOSPITALS.

With the State Sanatoria being used for specialized tuberculosis services and the increasing demand for hospitalization the county and municipal hospital units have been called upon to build new plants or expand existing institutions. They are nearly all responding and developing their programs for future as well as for present needs. It may be well to enumerate the progress made in 1928 for providing adequate hospital facilities for the tuberculous.

The Trustees of the Middlesex County Tuberculosis Hospital District were authorized by Chapter 369 of the Acts of 1928 to build and equip a hospital at a cost not exceeding \$1,250,000. The Worcester County Tuberculosis Hospital District was authorized by Chapter 368 of the Acts of 1928 to build and equip a hospital at a cost not exceeding \$600,000. The Essex County Sanatorium is to add a hospital unit of 75 beds during 1929. The Norfolk County Hospital added 30 beds in 1928. Hampshire County is contemplating an addition during 1929. The Boston Sanatorium is now increasing its capacity 150 beds. The cities of Springfield and Worcester expect to enlarge in the near future. If the request of the Department for additions at Lakeville and North Reading are approved by the next General Court there will be over seven hundred more beds available for the tuberculous in State, County and Municipal Sanatoria by the end of 1930. With the exception of the cities of Springfield and Worcester and the Hampden County Tuberculosis Hospital District the hospitalization program of the State has been especially well carried out.

SUBSIDY.

The subsidy law was placed upon the statute books in 1911 to encourage local communities to build tuberculosis hospitals. At that time 4,418 people in Massachusetts were dying yearly from tuberculosis, and there were approximately 1,200 beds available. In 1928 there were 2,691 deaths with 3,600 beds available, with 700 more promised so that in 1930 there will be 4,300 beds available in Massachusetts. The subsidy law would, therefore, seem to have served its original purpose. I would recommend the repeal of this law. If the General Court does not approve I would suggest that the present law be amended so that subsidy would be paid only to those cities and towns that are providing satisfactory tuberculosis service to their citizens other than hospitalization. For the year ending November 30, 1928, there have been received 2,466 claims for subsidy from 100 cities and towns. Of this number 2,096 claims, amounting to \$240,335.97, were allowed and paid.

LAKEVILLE STATE SANATORIUM.

RESIDENT OFFICERS.

LEON A. ALLEY, M.D., *Superintendent*.
 HAROLD RAGOLSKY, M.D., *Assistant Superintendent*.
 PETER FERRINI, M.D., *Assistant Physician*.
 HENRY R. BLOOM, M.D., *Assistant Physician*.
 CHIN S. CHANG, M.D., *Junior Bacteriologist*.
 CAROLINE T. WHITE, R.N., *Superintendent of Nurses*.
 MARY C. O'CONNELL, *Head Teacher Institution School*.
 KATHERINE NUTE, *Head Occupational Therapist*.
 FLORENCE S. MONROE, *Senior Bookkeeper and Treasurer*.
 CHESTER TAYLOR, *Steward*.
 ROBERT A. KENNEDY, *Chief Power Plant Engineer*.
 THOMAS F. MAHONEY, *Head Farmer*.
 SUSAN M. MURPHY, *Head Housekeeper*.

NON-RESIDENT OFFICERS.

ZABDIEL B. ADAMS, M.D., *Senior Physician (Orthopedic)*.
 LOUIS A. O. GODDU, M.D., *Senior Physician (Orthopedic)*.
 EMANUEL KLINE, D.M.D., *Dentist*.

Report of the Superintendent.

To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health*.

I have the honor to submit the nineteenth annual report of the Lakeville State Sanatorium for the year ending November 30, 1928. During the year there has

been expended \$202,658.48 for maintenance, a gross weekly per capita cost of \$20.095. There has been collected from miscellaneous sources (the total of all collections), \$76,746.98. Deducting this amount from the gross maintenance expense, leaves a net expense of \$125,911.50 and a net weekly per capita cost of \$12.4850. There has been collected from private sources \$7,545.00, from Cities and Towns \$65,715.81, from the State Board of Retirement \$21.22, and from Sales \$3,464.95. There were 38 patients supported wholly or in part by private funds, 207 by Cities and Towns, 61 wholly by the State, 2 State Wards, and 36 patients on whom settlement has not been determined.

There has been expended from special appropriation, authorized by Acts of 1925, 1926, 1927, 1928 (\$48,938.92 for New Water System) prior to 1928, \$44,620.92, during 1928 \$549.50; total \$45,170.42, reverting to State Treasury \$2,268.50. Not completed. As authorized by chapter 79, Acts of 1926 (\$40,000.00 for Re-conditioning Men's Building) expended prior to 1928 \$39,497.84, nothing in 1928, reverting to State Treasury \$502.16. This work has been completed. As authorized by chapter 138, Acts of 1927 (\$25,000.00 Surgical Building) expended prior to 1928 \$15,292.29, during 1928 \$9,348.21. Total \$24,640.50. As authorized by chapter 138, Acts of 1927 and chapter 127, Acts of 1928 (\$45,000.00 Sewage Disposal) expended prior to 1928, \$669.29, during 1928 \$22,381.02, total \$23,050.31. Not completed. As authorized by chapter 127, Acts of 1928 (\$3,000.00 Fire Protection). No expenditures to date. As authorized by chapter 127, Acts of 1928 (\$22,000 Remodeling South Pavilion) expended during 1928, \$20,753.00. Not completed. As authorized by chapter 127, Acts of 1928 (\$56,-800.00 Nurses Home) expended during 1928 \$18,430.77. Not completed. As authorized by chapter 127, Acts of 1928 (\$15,000.00 Engine Room) expended during 1928, \$9,080.62. Not completed. As authorized by chapter 127, Acts of 1928 (\$8,000.00 Steamline) expended during 1928, \$3,100.00. Not completed.

There were 194 patients in the Sanatorium at the beginning of the year, December 1, 1927, and 204 at the close, November 30, 1928. The largest number present at one time was 208, and the smallest 180. The daily average number of patients was 193.9426, 6.2112 more than last year. Daily average number of bed patients was 171.1311, children 106.7158, adults 64.4153. There were 150 patients admitted during the year. For the classification of patients admitted, your attention is called to "Table No. 7." The average age of patients admitted was 22 years. Including deaths there were 140 patients discharged, and the average duration of residence was 366 days. Of those discharged 80 gained 1,096.25 pounds, an average gain of 13.70 pounds per person. Of those discharged there were 56 arrested, 7 apparently arrested, 4 quiescent, 27 improved, 11 unimproved, 20 deaths, 10 not considered, the duration of treatment being less than one month, 5 non-tuberculous. There were 70,983 hospital days of treatment, 2,461 hospital days more than for 1927.

APPOINTMENTS AND RESIGNATIONS.

The part time position of Dentist was abolished April 14, 1928, upon the creation of a full time position. The dentist working at this institution four days a week and two days at the Pondville Hospital at Norfolk. Dr. Emanuel Kline was appointed to the full time position June 18, 1928.

Dr. Peter Ferrini, a graduate of Harvard Medical School, 1927, followed by an internship at the Brockton Hospital, was appointed Assistant Physician Sept. 1, 1928.

Dr. V. A. Pelletier resigned Nov. 4, 1928, to accept the position of Senior Assistant Physician at the Pondville Hospital at Norfolk.

Miss Mary O'Connell, graduate of the State Normal School, Lowell, 1926, was appointed Head Teacher of Institution School Nov. 21, 1928.

MEDICAL REPORT.

Heliotherapy has been continued during the year with the most gratifying results. Many patients have been treated by means of the ultra-violet ray and the results show the importance of extending and increasing this type of treatment as rapidly as possible.

The opportunity to complete the treatment of the patients by surgical inter-

vention at this institution has been made possible by the surgical building which was completed the latter part of 1927. This has been a great advantage over transferring patients to other hospitals for operation which was necessary in the past. Seventeen major and six minor operations were performed during the year.

Patients were examined for subsidy at the Barnstable County Hospital, Pocasset, Bristol County Hospital, Attleboro, Fall River Tuberculosis Hospital, Fall River, Plymouth County Hospital, South Hanson, and Sassaquin Sanatorium, New Bedford. A total of 116 patients were examined at these Sanatoria. There were 63 patients examined at this institution.

	Positive.	Negative,	Suspicious.	Totals.
Barnstable County Hospital, Pocasset .	2	1	—	3
Bristol County Hospital, Attleboro .	9	5	—	14
Fall River Tuberculosis Hospital, Fall River	34	19	1	54
Plymouth County Hospital, South Hanson	17	4	3	24
Sassaquin Sanatorium, New Bedford .	17	3	1	21
	79	32	5	116

Patients examined at the sanatorium:

	Positive.	Negative.	Re-exam.	Totals.
Out-patients	28	5	3	36
Employees	27	—	—	27
	55	5	3	63

Total examinations, 179.

LABORATORY, X-RAY AND PHOTOGRAPHIC REPORT.

The usual routine work has been carried out during the past year by the staff of the laboratory. All laboratory diagnostic methods have been made possible by the complete equipment installed during the past two years.

<i>Clinical Microscopy</i>	Number
Blood { Hemoglobin determination	196
Blood { Blood Counts	245
Blood { Coagulation Time	4
Blood { Blood Grouping	13
Sputum { Positive T. B.	29
Sputum { Negative T. B.	142
Urine Analysis	2,600
Spinal Fluid	6
Feces	8
Pleural Fluids	3

Bacteriological and Serological Tests

Diphtheria Throat Cultures	{ Positive K. L.	3
Diphtheria Throat Cultures	{ Negative K. L.	54
Tuberculous Pus Examinations		460
Vincent's Angina		12
Milk-plate counts		6
Occult Blood Test		11
Guaiaec Test		13
Isolation and Cultivation of Tubercle Bacilli		184
Phenolsulphonphthalein Test		188
Von Pirquet Test	{ Positive	8
Von Pirquet Test	{ Negative	222
Typhoid Agglutination Test		64
Wassermann Test	{ Positive	4
Wassermann Test	{ Doubtful	3
Wassermann Test	{ Negative	160
Kahn Test	{ Positive	1
Kahn Test	{ Negative	16

Animal Experiment

	Number
Autopsies	52
Inoculations	109
	213

Pathology

Pathological Examinations	7
Post-mortem Examinations	2

Preparation of Media (each month)

Glycerine Bouillon
Glycerine Agar
Blood Agar Plates
Petroff's Medium

Total	5,038
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*Proven Tuberculosis**Diagnosis*

Pulmonary Tuberculosis	8
Tuberculous Wrist	3
Tuberculous Elbow	1
Tuberculous Foot	1
Tuberculous Groin	1
Tuberculous Hip	15
Tuberculous Knee	3
Tuberculous Kidney	5
Tuberculous Ankle	3
Tuberculous Mastoid	1
Tuberculous Rib	1
Tuberculous Thoracic Sinus	1
Tuberculous Spine	4
Tuberculous Finger	2
Tuberculous Superficial Cervical Gland	3
Tuberculous Preauricular Gland	1

53

X-Rays.

Number of X-rays taken from December 1, 1927, to November 30, 1928 . 506

Photographs.

Number of photographs taken from December 1, 1927, to November 30, 1928 . 204

DENTAL REPORT.

The report which follows covers the period from June 18, 1928, to December 1, 1928.

Examinations	184
Prophylaxis treatments	160
Extractions	105
Irrigations	14
Fillings	195
Treatments	175
Radiographs	7
Restorations	1

Total operations	841
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General anesthesia	6
Vincent's infection	4
Visits	314
Dismissals	62

Following is a brief outline of the policies of the Dental Department:

1. To make a thorough oral examination of every patient admitted to the hospital.
2. To do oral prophylaxis within a few days after admission on every patient whose condition warrants dental treatment.
3. To do remainder of necessary dental treatment at subsequent sittings in the order following:
 - (a) Relief of pain.
 - (b) Treatment of oral infection.
 - (c) Radiographs of doubtful teeth.
 - (d) Fillings.
 - (e) Extractions.
 - (f) Restorations.
4. To dismiss all completed mouths for a period of six months and at the termination of this time the routine is again repeated.
5. To re-examine all patients previous to discharge whether completed cases or not.

The patients are instructed in the value of oral hygiene and the necessity of maintaining good, clean, healthy mouths. Every effort is made to prevent pain, the following methods being used:

Adults: Novacaine injections infiltration and conduction anesthesia, ethyl chloride local anesthesia, gas oxygen and ether general anesthesia.

Children: Novacaine injections infiltration and conduction anesthesia, ethyl chloride general anesthesia.

A difficult dental problem presents itself in this institution where many patients, due to the type of their disease, and the construction of casts and frames, must remain in an undisturbed position. This necessitates work on some patients being done in their beds in the ward, while others come to the clinic on trucks and must receive their dental treatment in this position. This not only consumes much more time than ordinary work in the chair but also requires continual rearrangement of the equipment.

OCCUPATIONAL THERAPY.

It has been the aim of the Occupational Therapy Department this year to reach as many of the patients in the hospital as was consistent with therapeutic measures, and to improve the grading and quality of the work. On December 1st last year there was an enrollment of 111 patients against 164 patients this year. The number of therapists has remained the same. Miss Shepard received the appointment of assistant in March but she had already been with us for a year as a volunteer worker. The Boston School of Occupational Therapy has continued to send two students a month to us for training, so for the greater part of the year we have had four workers in the field. Student workers have proven of great value to us where we have been dealing with such large numbers, although the length of the training period is much too short for best results. At the present time there are very few patients on a ward who have not been working some part of the Occupational Therapy period.

The Occupational Therapy Department moved into new headquarters last June when the plaster room was moved over into the new Surgical Building. This move has given us the advantage of a cleaner and lighter room and the opportunity to display some of our crafts — also an increase in sales.

The crafts most popular this past year were leather, basketry (mostly trays, bud vases and cradles) and knotting. There have been about 135 leather pieces completed. Most of it has been tooled and some few pieces beaded. Thirty cradles were rushed through for the Christmas season, making a total of about 45 for the year. During the past three weeks 38 trays have been turned out totaling 165 for the year. Approximately 25 knotted articles have been completed including belts, leashes and bags. Many novelties have been made and of course with the children it has been mostly kindergarten work and basketry in its simpler forms.

Opportunities were given us to prepare and read papers on our phase of Occupational Therapy at the Massachusetts Association for Occupational Therapy conference held in Boston and before the Framingham Women's Club.

FARM.

The farm has had a satisfactory year continuing to produce all the milk, eggs and poultry used in the institution as well as a large amount of garden products in their season. The herd continues to be accredited. The yield from the orchards was very small, due to the heavy rains early in the year.

IMPROVEMENTS AND CHANGES.

The South Pavilion was remodeled and equipped, providing 30 additional beds for male patients, thereby relieving the waiting list considerably.

A new stack has been built at the Power Plant and two new 72" boilers were installed. A 75 KW Generator has been purchased.

Construction on the new Nurses' Home was begun in July. This building should be completed by the Spring of 1929.

Six filter beds, with a dosing tank have been constructed for sewage disposal and the buildings are now being connected to the new system by a new pipe line.

The Steam line from the Men's Ward to the Administration Building and Women's Ward was renewed.

EDUCATIONAL WORK.

Educational work has been continued by the Occupational Therapy Department, and school work has been started. One head institution school teacher was appointed on Nov. 21, 1928. As soon as the work is properly organized an assistant teacher is to be taken on to help carry on individual instruction as well as class work.

CLEAR POND.

Work has progressed satisfactorily on cleaning up the water shed at Clear Pond and removing brush from the fence line.

LAUNDRY.

The Laundry was transferred to the State Farm in September, 1928. Thus far the change has not been entirely satisfactory to this institution but we hope as time goes on that the present difficulties will be surmounted.

RECOMMENDATIONS.

A new children's building containing an isolation unit and lamp treatment room is greatly needed. The length of residence for children is a long one averaging from three to five years, thus resulting in a very long waiting list with the resultant delay in the admission of new cases sorely in need of treatment. No facilities are available at present for the isolation of contagious diseases. Cloudy and stormy weather during the year result in much valuable time being lost in the treatment of patients because of the lack of proper construction and equipment for artificial light treatment. I feel that a Children's Building is the paramount need of this institution for the coming year.

Yearly appropriations should be available for several years to continue the clearing of the water shed at Clear Pond until this work has been completed.

The installation of automatic sprinklers should be continued until all the buildings are properly protected.

ENTERTAINMENTS.

Moving pictures have been shown on the various wards during the past year. Radio-entertainments have been continued.

RELIGION.

Because of the increase in the number of ambulatory patients religious services in the chapel were again possible and are now being carried on weekly by both Catholic and Protestant denominations. The Jewish chaplain continues to visit in the wards.

ACKNOWLEDGMENTS.

To the many friends and organizations who have so generously donated books, magazines, toys and innumerable other gifts to the patients, especially the children at this institution, I wish to express for the staff and patients our heartfelt thanks for their kindness. If the various donors could but see the pleasure brought to even one of our small patients, I am sure they would feel amply rewarded. The generosity of friends of the institution has been felt and demonstrated more than ever during the past year.

The many loyal and cooperative employees who have continued their services during the past year merit public approval, and it is with great personal pleasure and gratification that I commend their valued services.

Your valued advice and confidence during the past year are gratefully acknowledged.

Respectfully submitted,
LEON A. ALLEY, M.D.,
Superintendent.

POPULATION.

	Males.	Females.	Boys.	Girls.	Totals.
Number received during the year	42	35	37	36	150
Number passing out of the Institution during the year	29	47	38	26	140
Number at end of the fiscal year in the Institution	49	30	70	55	204
Daily average attendance (number inmates actually present during year)	38	36	66	53	193
Average number of employees and officers during the year	88.4112	47.9158	—	—	136.3270

EXPENDITURES.

Current Expenditures:					
Salaries and wages			\$122,336	35	
Clothing				298	02
Subsistence				27,188	00
Ordinary				3,710	23
Office, Domestic, Outdoors Expenses				49,125	88
					\$202,658 48
Extraordinary Expenses:					
Permanent Improvements:					
New Water System (Chapter 277, Acts 1927-28)			\$549	50	
Surgical Building (Chapter 138, Acts 1927)				9,348	21
Addition to Fire Protection (Chapter 127, Acts 1928).	(No Expenditures.)				
Sewage Disposal (Chapter 127, Acts 1928)				22,381	02
Remodelling South Pavilion (Chapter 127, Acts 1928)				20,753	00
Nurses Home (Chapter 127, Acts 1928)				18,430	77
Engine Room (Chapter 127, Acts 1928)				9,080	62
Steamline (Chapter 127, Acts 1928)				3,100	00
					83,643 12
Grand Total					\$286,301 60

Summary of Current Expenses.

Total Expenditures	\$286,301 60
Extraordinary Expenses Deducted	83,643 12
	\$202,658 48
Deducting amount of Sales	3,464 95
	\$199,193 53

Dividing this amount by the daily number of patients, 193.9426, gives a cost for the year of \$1,027.0746, equivalent to an average weekly net cost of \$19.75143.

VALUATION.

Land.

Grounds, 50 acres	\$7,155 30
Lawns and Buildings, 48 acres	535 70
Roads, 2 acres.	
Woodland, 10 acres	1,730 37
Mowing, 34 acres	4,311 81
Tillage, 49 acres.	
Tillage, 30 acres.	
Garden, 19 acres.	
Orchard, 8 acres	611 65
Pasture, 41 acres	1,816 41
Waste and miscellaneous, 17 acres	942 27
Meadow, pasture and swamp land, 16 acres.	
Coal Trestle, 1 acre.	
	\$17,103 51
New Sewerage Disposal	23,050 31
	\$40,153 82

Buildings.

Institution Buildings	\$355,830 00
Farm, Stable and Grounds	55,373 26
Miscellaneous	147,351 48
	\$598,708 56
Present value of all personal property as per inventory of Nov. 30, 1928	10,874 63
Grand Total	\$609,583 19

Statistical Tables.

TABLE 1. — *Admissions and Discharges.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Boys.	Girls.	
Patients in the Sanatorium Nov. 30, 1927	33	40	74	47	194
Patients admitted Dec. 1, 1927, to Nov. 30, 1928	42	35	37	36	150
Patients discharged Dec. 1, 1927, to Nov. 30, 1928	29	47	38	26	140
Patients remaining in Sanatorium Nov. 30, 1928	49	30	70	55	204
Daily average number of patients	38.4673	36.4480	66.0710	52.9563	193.9426
Deaths (included in number discharged)	5	6	7	2	20

TABLE 2. — *Civil Condition of Patients admitted.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Boys.	Girls.	
Single	19	23	37	36	115
Married	22	11	—	—	33
Widowed	1	1	—	—	2
	42	35	37	36	150

TABLE 3. — *Age of Patients admitted.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Boys.	Girls.	
1 to 13 years	—	—	22	16	38
13 to 17 years	—	—	6	10	16
17 to 20 years	—	—	6	8	14
20 to 30 years	16	18	3	2	39
30 to 40 years	11	12	—	—	23
40 to 50 years	10	4	—	—	14
Over 50 years	5	1	—	—	6
	42	35	37	36	150

TABLE 4. — *Nativity and Parentage of Patients admitted.*

	ADULTS.						CHILDREN.						TOTALS.		
	MALE.			FEMALE.			BOYS.			GIRLS.			Patients.	Father.	Mother.
	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.	Patients.	Father.	Mother.			
United States:															
Massachusetts	15	3	4	19	8	8	26	12	15	28	9	7	88	32	34
Other New Eng. States . . .	2	2	1	3	5	3	4	3	4	—	—	1	9	10	9
Other States	2	—	1	3	4	3	1	2	—	3	2	3	9	8	7
	19	5	6	25	17	14	31	17	19	31	11	11	106	50	50
Other Countries:															
Armenia	—	—	—	—	—	—	1	1	1	—	—	—	1	1	1
Austria	—	—	—	—	—	—	—	1	—	—	—	—	1	3	2
Canada	10	11	13	3	3	5	—	2	—	1	2	3	14	18	21
China	1	1	1	—	—	—	1	—	1	—	—	—	2	1	2
Czecho-Slovakia	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1
England	1	—	1	1	1	1	—	—	—	—	1	—	2	2	2
Finland	1	1	1	—	—	—	—	—	—	—	1	1	1	2	2
Germany	1	1	1	—	—	—	—	—	—	—	—	1	1	1	2
Greece	—	—	—	1	1	1	—	—	1	—	—	—	1	1	2
Ireland	2	8	8	—	3	2	—	7	5	—	5	3	2	23	18
Italy	3	3	3	3	5	5	1	5	4	1	2	2	8	15	14
Lithuania	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1
Portugal	—	—	—	1	1	1	—	—	—	—	3	3	1	4	4
Poland	—	1	1	—	—	—	1	1	1	—	2	2	1	4	4
Russia	1	1	2	—	1	1	1	1	1	1	3	4	3	6	8
Scotland	—	2	—	—	—	—	1	—	1	—	1	1	2	3	2
Sweden	2	3	3	—	1	1	—	—	—	—	1	1	2	5	5
Syria	1	1	1	—	—	—	—	—	—	—	—	—	1	1	1
Turkey	—	—	—	—	—	—	—	—	—	1	2	2	1	2	2
Unknown	—	4	1	—	—	2	—	2	3	—	—	—	—	6	6
	42	42	42	35	35	35	37	37	37	36	36	36	150	150	150

TABLE 5. — *Residence of Patients admitted.*

	Adults.	Children.	Totals.
Amesbury	1	1	2
Boston	25	20	45
Braintree	—	—	1
Bridgewater	—	1	1
Brockton	2	1	3
Brookline	1	—	1
Cambridge	1	1	2
Campello	1	—	1
Chelsea	4	2	6
Chicopee Falls	—	1	1
Easthampton	—	1	1
Everett	3	1	4
Falmouth	1	—	1
Fitchburg	—	1	1
Frammingham	—	1	1
Gardner	1	—	1
Gloucester	1	—	1
Greenfield	—	1	1
Groveland	1	—	1
Haverhill	3	—	3
Lawrence	3	2	5
Lexington	—	1	1
Lowell	—	5	5
Lynn	1	3	4
Malden	1	—	1
Maynard	—	1	1
Medford	2	—	2
Melrose	1	—	1
Melrose Highlands	1	—	1
Methuen	—	1	1
Middleborough	—	1	1
Newburyport	—	1	1
New Bedford	3	—	3
North Easton	—	1	1
Norwood	—	1	1
Orange	1	—	1
Princeton	1	—	1
Rutland	1	—	1
Quincy	—	1	1
Pembroke	1	—	1
Pittsfield	—	1	1
Salem	1	3	4
Somerville	2	—	2

TABLE 5. — *Residence of Patients admitted — Concluded.*

	Adults.	Children.	Totals.
Southbridge	2	—	2
Southwick	—	1	1
Springfield	1	—	1
Stoneham	—	1	1
Stoughton	—	2	2
Taunton	—	3	3
Uxbridge	1	—	1
Wakefield	—	1	1
Waltham	1	—	1
Wareham	—	1	1
Watertown	3	1	4
Wayland	1	—	1
Wellesley	—	1	1
Williamsburg	—	1	1
Winchester	1	1	2
Winthrop	—	1	1
Woburn	—	2	2
Worcester	2	3	5
	77	73	150

TABLE 6. — *Occupations.*

	Males.	Females.	Boys.	Girls.	Totals.
Attendant	—	2	—	—	2
Automobile Electrician	1	—	—	—	1
Baker	1	—	—	—	1
Bookbinder	—	—	—	—	1
Bookkeeper	1	3	—	—	4
Bundle wrapper	—	—	1	—	1
Cabinet maker	1	—	—	—	1
Candy factory	—	—	1	—	1
Carpenter's helper	1	—	—	—	1
Cashier	—	1	—	—	1
Chauffeur	1	—	—	—	1
Child	—	—	16	8	24
Clerk:					
Cost	1	—	—	—	1
Office	2	4	—	—	6
Store	1	1	1	—	3
Clothes dyer	1	—	—	—	1
Cook	1	—	—	—	1
Elevator operator	1	—	—	—	1
Fireman	1	—	—	—	1
Fisherman	1	—	—	—	1
Furrier	—	1	—	1	2
Garment stitcher	—	1	—	—	1
Home, at	1	4	—	4	9
Housemaid	—	1	—	1	2
Housewife	—	10	—	—	10
Iceman	2	—	—	—	2
Janitor	1	—	—	—	1
Laboratory packer	—	1	—	—	1
Laborer	5	—	—	—	5
Launderer	1	—	—	—	1
Longshoreman	1	—	—	—	1
Meat cutter	1	—	—	—	1
Mechanic	1	—	1	—	2
Needle maker	1	—	—	—	1
Night watchman	1	—	—	—	1
Nurse	—	1	—	—	1
Painter	2	—	—	—	2
Porter	—	—	1	—	1
Press operator	—	—	1	—	1
Rubber coat factory	—	—	1	—	1
Saleswoman	—	2	—	—	2
School	—	—	12	18	30
Shipper	—	—	1	—	1
Shoe shop	1	—	—	—	1
Stenographer	—	—	—	1	1
Storekeeper	1	—	—	—	1
Student	—	1	—	—	1
Tailoress	—	—	—	2	2
Teacher	1	—	—	—	1
Telephone instructor	—	1	—	—	1
Time keeper	1	—	—	—	1
Toy ship, shipper	1	—	—	—	1
Typist	—	1	—	—	1
Waitress	—	—	—	1	1
Weaver	2	—	—	—	2
Woolen mill:					
Bale wrapper	—	—	1	—	1
Carder	1	—	—	—	1
Dyer	1	—	—	—	1
Total number Occupations, 58	42	35	37	36	150

TABLE 7. — *Stage of Disease on Admission.*

<i>One Lesion.</i>	Males.	Females.	Boys.	Girls.	Totals.	Per-centage.
Tb. Abdominal Sinus	—	1	—	—	1	.67
Tb. Adenitis, Cervical	3	2	1	1	7	4.66
Tb. Ankle	1	2	2	2	5	3.33
Tb. Bladder	—	1	—	—	1	.67
Tb. Coecum	—	1	—	—	1	.67
Tb. Dactylitis	—	—	1	—	1	.67
Tb. Elbow	1	—	—	—	1	.67
Tb. Epidydimitis	1	—	—	—	1	.67
Tb. Head of Femur	—	—	1	—	1	.67
Tb. Glands	—	—	—	1	1	.67
Tb. Hand	—	—	—	1	1	.67
Tb. Hip	2	2	5	3	12	8.
Tb. Kidney	3	2	1	—	6	4.
Tb. Knee	2	—	4	4	10	6.66
Tb. Iritis	1	—	—	—	1	.67
Tb. Nephritis	—	—	1	—	1	.67
Tb. Ovary	—	1	—	—	1	.67
Tb. Peritonitis	1	2	—	5	8	5.33
Tb. Peritonitis with effusion	—	—	—	1	1	.67
Tb. Phlyctenular Keratitis	—	—	—	2	2	1.33
Tb. Sacro-iliac	—	1	1	—	2	1.33
Tb. Skin	1	2	2	—	5	3.33
Tb. Spine	12	7	5	8	32	21.33
Tabes Mesenterica	1	—	1	2	4	2.66
Tb. Tibia	—	—	1	—	1	.67
Tb. Greater Trochanter	—	—	1	—	1	.67
Tb. Uveitis	1	1	—	—	2	1.33
Tb. Wrist	—	1	—	—	1	.67
	30	24	27	30	111	—
<i>Two Lesions.</i>						
Tb. Adenitis, Cervical, Imbecility	—	—	—	1	1	.67
Tb. Adenitis, Cervical, Tb. Skin	1	—	—	1	2	1.33
Tb. Adenitis, Cervical, Pulmonary Tub.	—	1	—	—	1	.67
Tb. Colitis, Pulmonary Tub.	—	2	—	—	2	1.33
Tb. Elbow, Pulmonary Tub.	1	—	—	—	1	.67
Tb. Hip, Renal Tub.	—	—	1	—	1	.67
Tb. Mesenteric lymph nodes, Omentum	—	—	—	1	1	.67
Tb. Nephritis, Pulmonary Tub.	—	—	1	—	1	.67
Tb. Peritonitis, Tb. Phlyctenular Keratitis	—	—	—	1	1	.67
Tb. Peritonitis, Pulmonary Tub.	—	1	—	—	1	.67
Pulmonary Tub., Arthritis Spine	1	—	—	—	1	.67
Renal Tub., Basal Cancer of Nose	1	—	—	—	1	.67
Tb. Sacro-iliac, Pul. Tub.	1	1	—	—	2	1.33
Tb. Spine, Tb. Knee	—	1	—	—	1	.67
Tb. Spine, Pulmonary Tub.	1	1	—	—	2	1.33
Tb. Spine, Tb. Sacro-iliac	—	1	—	—	1	.67
Tb. Spine, Tb. Sinus groin	—	—	1	—	1	.67
Tb. Wrist, Tb. Hip	1	—	—	—	1	.67
	7	8	3	4	22	—
<i>Three Lesions.</i>						
Tb. Ankle, Tb. Wrist, Tb. Spine	—	—	—	1	1	.67
Tb. Knee, Tb. Hip, Tb. Testicle	1	—	—	—	1	.67
Tabes Mesenterica, Old Rickets, Enuresis	—	—	1	—	1	.67
Tb. Rib, Tb. Abscess Chest Wall, Tb. Abscess Lumbar Region	—	—	1	—	1	.67
	1	—	2	1	4	—
<i>Four Lesions.</i>						
Tb. Elbow, Tb. Hip, Tb. Knee, Right Facial Paralysis	—	—	1	—	1	.66
<i>Five Lesions.</i>						
Tb. Kidney, Pul. Tub., Pul. Osteoarthropathy, Tb. Bladder, Tb. Spine	1	—	—	—	1	.66
<i>Non-Tuberculous.</i>						
Chronic Arthritis	—	—	1	—	1	.66
Infectious Arthritis	1	—	—	—	1	.66
Fecal Fistula, post-operative	—	1	—	—	1	.66
Neurasthenia	—	1	—	—	1	.66
Osteomyelitis	1	—	—	—	1	.66
Peri-nephritic abscess	1	—	—	—	1	.66
Unclassified	—	1	3	1	5	3.33
	3	3	4	1	11	—

TABLE 8. — *Condition on Discharge.*

	ADULTS.		CHILDREN.		Totals.	Per-centage.
	Males.	Females.	Boys.	Girls.		
Arrested	9	15	20	12	56	40.
Apparently Arrested	1	3	2	1	7	5.
Quiescent	—	2	1	1	4	2.86
Improved	8	10	4	5	27	19.29
Unimproved	1	5	2	3	11	7.86
Died	5	6	7	2	20	14.28
Not Considered	4	4	1	1	10	7.14
Non-Tuberculous	1	2	1	1	5	3.57
	29	47	38	26	140	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Fe-males.	Boys.	Girls.	Totals.	LENGTH OF RESIDENCE IN SANATORIUM.				
						Males.	Fe-Males.	Boys.	Girls.	Totals.
MONTHS.										
Less than 1	—	—	—	—	—	1	—	—	1	2
1 to 2	—	—	—	—	—	1	1	—	—	2
2 to 3	—	—	—	—	—	1	—	—	—	1
3 to 4	—	—	—	—	—	—	1	—	—	1
4 to 5	—	1	—	—	1	—	—	—	—	—
5 to 6	—	—	—	—	—	—	1	—	—	1
6 to 7	—	—	—	—	—	—	—	1	—	1
7 to 8	—	—	—	—	—	—	—	—	—	—
8 to 9	—	—	—	—	—	—	—	1	—	1
10 to 12	—	—	1	—	1	—	—	1	1	2
12 to 18	2	1	1	—	4	2	—	2	—	4
18 to 24	—	1	2	—	3	—	2	1	—	3
Over 2 years	3	3	3	1	10	—	1	2	—	3
Unknown	—	—	—	1	1	—	—	—	—	—
	5	6	7	2	20	5	6	7	2	20

TABLE 10. — *Cause of Death.*

	Males.	Females.	Boys.	Girls.	Totals.
Tb. Hip and Amyloid Disease	—	—	1	—	1
Tb. Hip and Tb. Meningitis	—	—	1	—	1
Tb. Hip and Post Operative Shock	1	—	—	—	1
Tb. Knee, Dactylitis, Elbow, Wrist and Adenitis	—	1	—	—	1
Tb. Knee and Post Operative Shock	—	—	—	1	1
Tb. Knee, Pulmonary Tub., Chronic Myocarditis	1	—	—	—	1
Tb. Kidney and Tb. Spine	—	1	—	—	1
Tb. Kidney, Lungs, Bladder, Hypertrophied Prostate	1	—	—	—	1
Tb. Mediastinitis, Adenitis, Lupus Vulgaris	—	—	1	—	1
Pulmonary Tub., Tb. Colitis	—	1	—	—	1
Tb. Spine, Tb. Hip	—	—	1	—	1
Tb. Spine, Knee, Amyloid Disease, Chronic Myocarditis	—	—	1	—	1
Tb. Spine, Myocardial Failure	—	1	—	—	1
Tb. Spine, Pulmonary Tub.	1	1	1	—	3
Tb. Spine, Toxemia	1	—	—	—	1
Tb. Sternum and Ribs	—	1	—	—	1
Retroperitoneal Sarcoma, Tb. Spine	—	—	—	1	1
Tb. Wrist, Amyloid Disease	—	—	1	—	1
	5	6	7	2	20

NORTH READING STATE SANATORIUM.

RESIDENT OFFICERS.

CARL C. MACCORISON, M.D., *Superintendent.*EARLE C. WILLOUGHBY, M.D., *Assistant Supt.*GERALD M. CARON, M.D., *Assistant Physician.*DOROTHEA F. WHITNEY, M.D., *Assistant Physician.*ELLEN MURRAY, R.N., *Superintendent of Nurses.*ETHEL M. KNIGHT, *Senior Bookkeeper and Treasurer.*J. ELLIS DOUCETTE, *Steward.*DANIEL J. SCOTT, *Chief Power Plant Engineer.*EDWARD J. O'LEARY, *Head Farmer.*CLARA J. GILL, *Head Housekeeper.*To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the 20th annual report of the North Reading State Sanatorium for the year ending Nov. 30, 1928.

During the year there has been expended \$196,283.25 for maintenance, a gross weekly per capita cost of \$17.92. There has been collected from miscellaneous sources \$65,232.27 (the total of all collections). Deducting this amount from the gross maintenance expenses, leaves a net expense of \$131,050.98. The net weekly per capita cost was \$12.04. There has been collected from private funds \$4,964.00; from cities and towns \$58,420.29. Thirty-three cases (including ten from Division of Child Guardianship) were supported by private funds; 288 by cities and towns and 73 wholly by state.

There were 213 patients at the Sanatorium at the beginning of the year, and 208 at the close. The largest number present at any one time was 220, and the smallest number was 197. The daily average number of patients was 208.61. There were 205 cases admitted during the year, 68 less than last year.

There were 161 cases admitted from cities and towns of over 25,000 population, and 44 cases from cities and towns under 25,000 population. The average age of patients was 9.7 years. Including deaths, there were 210 cases discharged, and the average duration of residence was 10 months and 27 days. Of those discharged 199 gained 2,156 lbs. — an average gain of 10.8 lbs. per person. Of the discharges there were 4 Well cases; 4 Apparently Well; 31 Apparently Cured, five more than last year; 82 Arrested; 41 Apparently Arrested; 12 Quiescent; 16 Improved. There were 9 patients Not Considered — the duration of treatment being less than one month. There were only four deaths — six less than last year. There were 76,352 hospital days.

The following table shows the classification on the application blank and our classification on admission:

	Classification on Application Blank.	Our Classification on Admission.
No disease	—	16
Bronchial Adenitis	—	9
Malnutrition	—	27
Hilum Tuberculosis	130	119
Minimal	35	11
Moderately Advanced	13	13
Advanced	4	2
Cervical Adenitis	2	1
Chronic Osteomyelitis of Left Tibia and Hu- meri	—	1
Chronic Valvular Disease of Heart	—	1
Hypertrophied Tonsils and Adenoids	—	1
Unclassified	19	4
Incipient (Suspicious)	2	—
	<hr/> 205	<hr/> 205

MEDICAL REPORT.

During the first week in December, 1927, we faced an epidemic of tonsillitis, otitis media and respiratory diseases. On February 23, 1928, a case of scarlet fever developed, followed by several other cases. Up to February 23rd, thirty-three employees and eighty-eight patients were affected. Thirteen employees had tonsillitis, one of whom had three attacks and another one two. There were two cases of broncho-pneumonia, one case of lobar pneumonia, four cases of acute bronchitis, six cases of otitis media and six cases of sinusitis, with the following complications — otitis media, seven; acute bronchitis, two; otitis media and acute bronchitis, one; catarrhal jaundice, one.

Among the little patients there were thirty-four cases of tonsillitis with the following complications; otitis media, six; cervical adenitis followed by peritonsillar abscess, one; acute bronchitis, one. There were twenty-five cases of otitis media with one complicated by broncho-pneumonia and one by lobar pneumonia; one case sinusitis; five cases broncho-pneumonia; one case lobar pneumonia, and eight cases of acute bronchitis. One of the cases of tonsillitis had a second attack followed by otitis media and scarlet fever.

From February 23rd to April 6th, three more scarlet fever cases developed, two of whom were patients and one an employee. There were twenty-three cases of tonsillitis among the patients, two complicated by otitis media; nine cases of otitis media, one complicated by tonsillitis; two cases of broncho-pneumonia, one complicated by otitis media, and one case of lobar pneumonia. Of the above, eight children had an attack of tonsillitis prior to Feb. 22nd, and seven had had otitis media prior to that time.

Among the employees there were ten cases of tonsillitis, one case of sinusitis, and one of broncho-pneumonia. Two of the tonsillitis cases had a similar attack prior to Feb. 22nd.

Cultures made from swabs taken from the throat and ears of fifty-four cases, dating from February 22nd to April 6th, showed the presence of haemolytic streptococci in thirteen; three were not reported.

On November 15, 1928, scarlet fever again broke out and at the end of the fiscal year, ten cases were isolated at the schoolhouse.

During the year three eye clinics were held at the Sanatorium — Dr. Thomas W. Odoneal of Beverly being kind enough to come to the Sanatorium for this purpose. Fifty-six little patients were examined at this clinic and glasses were prescribed for thirty-nine. In addition to these, four nose and throat clinics were held. Fifty patients were examined. Recommendations were made for the removal of tonsils and adenoids in sixteen cases. Tonsillectomies and adenectomies were performed on nine of the sixteen by Dr. Charles W. DeWolf, who presided over these clinics.

We believe that a more careful check up should be made on tonsils and adenoids of the children applying for admission to the Sanatorium, and where possible, operations should be performed before the children are sent to us. This also would apply to eye defects.

CLINICS.

The monthly consultation clinics at Lawrence and Haverhill were omitted during the months of February and March owing to our epidemic.

The total number of patients examined at these clinics was the same as that of last year.

The number of patients examined at the Sanatorium increased by 116.

Our consultation and out patient clinics have grown to such an extent that the time of one physician is needed for this phase of the work.

	Positive.	Negative.	Suspicious.	Total.
Consultation Clinic	16	1	38	65
Out Patient Clinic	98	6	399	503
Examination Clinic (Little Building)	12	—	5	17
Out Patient X-Rays	—	—	—	355

DENTAL REPORT.

The following table is a summary of the work done during the year:

Total number of patients, 722; Total number of operations, 1,449; Total number of dismissals, 142.

Operative Work. — Examinations, 409; Prophylaxis, 230; Extractions, 335; Amalgam fillings, 191; Cement fillings, 21; Porcelain fillings, 33; Temporary fillings, 126; Gold fillings, 2; Roentgenograms, 34; Treatments, 219.

LABORATORY REPORT.

The following examinations were made in our laboratory:

Sputum examinations: Positive, 179; Negative, 448; Total, 627. Urine analyses, 1,072; White Blood Counts, 124; Red Blood Counts, 3; Differential Blood Counts, 3; Babcock Milk Tests, 12; Throat Cultures, 50; Other Smears, 41; Widal tests, 156.

Report of Wassermann Tests. — Negative, 2.

SANATORIUM SCHOOL.

It became necessary to close the school the middle of February and use the class rooms for scarlet fever, throat, ear and respiratory cases. One class room was used as a barracks for employees. The class rooms were not available for

school work until the first of May. Although the school remained open throughout the month of July, the forced interruption showed its effect in the quality of work performed by the children. During the last month of the fiscal year, we were again forced to close the school and use the class rooms for isolation wards and barracks for employees. It seems a shame that we should be forced to close our school and neglect the education of our little charges in order to find a makeshift hospital for the care of contagious diseases and the housing of employees.

IMPROVEMENTS.

Alterations were made to the center portion of Pavilion A West. The terrazzo flooring and floor timbers in the west wing locker of Pavilion A West and the east wing locker of Pavilion A East were replaced. West Cottage, portions of West Ward and Pavilion A West, a portion of East Ward, Pavilions A and C East, the north side of the Administration Building, the Medical Building and a portion of the Laboratory were shingled. The Power House roof was also repaired. A new linoleum floor was laid in the nurses' and employees' dining rooms. The under drains to the filter beds were removed, cleaned, replaced and a chlorinating house built and a chlorinator installed.

Work was begun on the improvements to the Fire Protective system. Three new wells were driven and work begun on a new carpenter shop.

The alterations to the Service Building, including refrigeration, were completed this year.

RECOMMENDATIONS.

The experience of the past year with the two epidemics has forcibly demonstrated the need of sufficient and suitable quarters for our employees. Under normal operation we are twenty-five rooms short for our regular quota of employees. One can easily appreciate our difficulties when we are forced to add from ten to fifteen additional employees to meet the situation such as we have experienced this past year.

An isolation and receiving ward, combining an infirmary for sick employees is greatly needed. The class rooms at the schoolhouse should not be used from two to three months of every school year as a contagious ward and barracks for employees. I would recommend a new employees' building to accommodate at least thirty-five people and an isolation and receiving ward to accommodate no less than forty-eight persons. The addition of these buildings to our present equipment would necessitate the enlarging of our boiler room, the addition of a new boiler and the installation of a 75 KW engine and generator in the engine room.

Our water system is wholly inadequate to meet our present needs. A 75,000 gallon tank should be provided and a sufficient number of additional wells driven to supply our daily needs.

ACKNOWLEDGMENTS.

Our clergymen have held religious services weekly and have made numerous visits to the wards and pavilions during weekdays.

To the many friends interested in our children and the work at the Sanatorium, I wish to acknowledge our indebtedness for many gifts of books, reading matter, toys, games and entertainment.

PERSONNEL.

Our part-time dentist, Dr. Emanuel Kline, was transferred to full time work at the Lakeville Sanatorium and Pondville Hospital. Dr. Kline was a most efficient and painstaking practitioner and his services are very much missed.

I am indebted to the employees for their loyal assistance during the past year. Their co-operation and sacrifice of comfort and leisure during the recent epidemic are greatly appreciated.

Respectfully submitted,

CARL C. MACCORISON,
Superintendent.

VALUATION.

Land.

Grounds, 12.32 acres	\$593 45
Lawns and Buildings, 11.57 acres. Roads, .75 acres.	
Woodland, 23.16 acres	1,115 62
Mowing, 16.02 acres	771 68
Tillage, 6.51 acres	313 59
Tillage, .51 acres. Garden, 6.00 acres.	
Orchard, 3.99 acres	192 20
Pasture, .82 acres	39 50
Waste and Miscellaneous, 38.93 acres Rough Pasture, 8.17 acres. Meadow swamp land, 30.00 acres. Coal Trestle, .75 acres.	1,875 26

	\$4,901 30
Sewerage system	12,758 13

\$17,659 43

Buildings.

Institution Buildings	\$375,400 21
Farm, Stable and Grounds	19,393 59
Miscellaneous	102,576 30

497,370 10

	\$515,029 53
Present value of all personal property as per inventory of November 30, 1928	103,801 58

Grand Total \$618,831 11

POPULATION.

	Males.	Females.	Totals.
Number received during year	117	88	205
Number passing out of institution during year	120	90	210
Number at end of fiscal year in institution	101	107	208
Daily average attendance (number of inmates actually present during year)	103.45	105.16	208.61
Average number of employees and officers during year	46.78	49.82	96.60

EXPENDITURES.

Current Expenditures:		
1. Salaries and Wages	\$108,927 77	
2. Clothing	3,519 59	
3. Subsistence	55,475 83	
4. Repairs, Ordinary	3,695 75	
5. Office, Domestic and Outdoor Expenses	13,991 67	\$185,610 61

Extraordinary Expenses:

1. Permanent Improvements to Existing Buildings	10,672 64
	\$196,283 25

Summary of Current Expenses.

Total Expenditures	\$196,283 25
Deducting Extraordinary Expenses	185,610 61
Deducting Amount of Sales	184,537 72

Dividing this amount by the daily average number of patients — 208.61 gives a cost for the year of \$883.62, equivalent to an average weekly net cost of \$16.99.

Statistical Tables

TABLE I. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Sanatorium Dec. 1, 1927	104	109	213
Patients admitted from Dec. 1, 1927, to Nov. 30, 1928, incl.	117	88	205
Patients discharged from Dec. 1, 1927, to Nov. 30, 1928, incl.	120	90	210
Patients remaining in Sanatorium November 30, 1928	101	107	208
Daily average number of patients	103.44	105.15	208.59
Deaths (included in number discharged)	3	1	4

TABLE II. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	117	88	205
Total	117	88	205

TABLE III. — *Age of Patients Admitted.*

	Males.	Females.	Totals.	Per Cent.
1 to 13 years	103	72	175	85.37
14 to 20 years	14	16	30	14.63
Total	117	88	205	100

Average age of patients, 9.7 years.

TABLE IV. — *Nativity and Parentage of Patients Admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States	100	54	57	85	36	38	185	90	95
Massachusetts	96	45	51	81	30	30	177	75	81
Other N. E. States	3	6	4	4	4	7	7	10	11
Other States	1	3	2	—	2	1	1	5	3
Totals	100	54	57	85	36	38	185	90	95
Other Countries:									
Azores	—	—	—	—	1	1	—	1	1
Austria	—	—	—	—	2	2	—	2	2
Canada	11	16	22	1	16	11	12	32	33
Cape Verde Islands	1	1	1	—	—	—	1	1	1
England	—	4	1	—	1	2	—	5	3
Finland	—	1	1	—	2	2	—	3	3
France	—	—	—	—	—	1	—	—	1
Germany	—	—	—	—	—	1	—	—	1
Greece	—	—	—	—	1	1	—	1	1
Ireland	1	6	7	—	7	10	1	13	17
Italy	2	18	16	—	10	9	2	28	25
Lithuania	—	—	—	—	1	1	—	1	1
Norway	1	1	2	—	—	—	1	1	2
Poland	—	2	3	—	4	4	—	6	7
Portugal	—	1	1	—	—	—	—	1	1
Roumania	—	1	—	—	—	—	—	1	—
Russia	1	4	4	—	4	3	1	8	7
Scotland	—	3	1	1	2	1	1	5	2
Sweden	—	1	—	—	—	—	—	1	—
West Indies	—	1	—	1	1	1	1	2	1
Total Foreign	17	60	59	3	52	50	20	112	109
Unknown	—	3	1	—	—	—	—	3	1
Grand Totals	117	117	117	88	88	88	205	205	205

TABLE V. — *Residence of Patients Admitted.*

Amesbury, 3	Gloucester, 7	Quincy, 20
Andover, 1	Lawrence, 4	Reading, 1
Arlington, 2	Lexington, 1	Revere, 3
Beverly, 2	Lowell, 5	Salem, 4
Boston, 50	Lynn, 17	Somerville, 3
Braintree, 1	Malden, 13	Tewksbury, 2
Brookline, 1	Manchester, 2	Wakefield, 4
Cambridge, 18	Medford, 3	Watertown, 5
Chelmsford, 1	Melrose, 2	Westford, 1
Chelsea, 6	Methuen, 1	Winthrop, 1
Everett, 3	Newburyport, 5	Woburn, 1
Fall River, 2	Newton, 4	Total, 205
Framingham, 1	Peabody, 5	

TABLE VI. — *Occupations of Patients Admitted.*

	Males.	Females.		Males.	Females.
Clerk	1	—	Usher	1	—
Laborer	1	—	None	18	4
Mechanics' Helper	1	—			
Student	95	84	Totals	117	88

TABLE VII. — *Stage of Disease on Admission.*

	Males.	Females.	Totals.	Percentage.
No Disease	11	5	16	7.80
Bronchial Adenitis	9	—	9	4.39
Malnutrition	13	14	27	13.17
Hilum Tuberculosis	64	55	119	58.05
Minimal	7	4	11	5.37
Moderately Advanced	5	8	13	6.34
Advanced	2	—	2	.97
Tuberculous Cervical Adenitis	1	—	1	.49
Chronic Osteomyelitis of Left Tibia and Humeri	1	—	1	.49
Chronic Valvular Disease of Heart	—	—	1	.49
Hypertrophied Tonsils and Adenoids	—	1	1	.49
Unclassified	3	1	4	1.95
Totals	117	88	205	100

TABLE VIII. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Well	4	—	4	1.90
Apparently Well	2	2	4	1.90
Apparently Cured	21	10	31	14.24
Arrested	43	39	82	40.00
Apparently Arrested	21	20	41	20.00
Quiescent	5	7	12	5.65
Improved	10	6	16	7.00
Unimproved	4	3	7	3.24
Died	3	1	4	1.90
Not Considered	7	2	9	4.17
Totals	120	90	210	100

TABLE IX. — *Deaths.*

DURATION OF DISEASE.	Males.	Fe- males.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Fe- males.	Totals.
Under 1 month	—	—	—	—	—	—
1 to 2 months	—	—	—	—	—	—
2 to 3 months	—	—	—	1	—	1
3 to 4 months	—	—	—	—	—	—
4 to 5 months	—	—	—	—	—	—
5 to 6 months	—	—	—	—	—	—
6 to 7 months	—	—	—	—	—	—
7 to 8 months	—	—	—	—	—	—
8 to 9 months	—	—	—	—	—	—
9 to 10 months	—	—	—	—	—	—
10 to 11 months	—	—	—	—	—	—
11 to 12 months	—	—	—	—	1	1
12 to 13 months	—	—	—	1	—	1
13 to 14 months	—	1	1	1	—	1
15 to 16 months	—	—	—	—	—	—
17 to 18 months	—	—	—	—	—	—
19 to 20 months	—	—	—	—	—	—
21 to 22 months	—	—	—	—	—	—
23 to 24 months	—	—	—	—	—	—
Over 2 years	3	—	3	—	—	—
Totals	3	1	4	3	1	4

TABLE X. — *Cause of Death.*

	Males.	Females.	Totals.
Tuberculosis of Lungs	3	1	4

RUTLAND STATE SANATORIUM.

RESIDENT OFFICERS.

ERNEST B. EMERSON, M.D., *Superintendent.*
 WILLIAM B. DAVIDSON, M.D., *Assistant Superintendent.*
 PAUL DUFAULT, M.D., *Senior Physician.*
 ARMAND LAROCHE, M.D., *Assistant Physician.*
 JACOB KAMINSKY, M.D., *Assistant Physician.*
 GABRIEL NADEAU, M.D., *Assistant Physician.*
 DELYA E. NARDI, *Principal of School of Nursing.*
 RENA B. NAUSS, *Assistant Principal of School of Nursing.*
 MARY E. BELL, *Dietitian.*
 OLIN C. BLAISDELL, *Steward.*
 MARY A. BOYLE, *Senior Bookkeeper and Treasurer.*
 HARRY W. WENDELL, *Chief Power Plant Engineer.*
 JOSEPH A. CARROLL, *Head Farmer.*
 CORA A. PHILLIPS, *Head Housekeeper.*

NON-RESIDENT OFFICERS.

FRANK H. WASHBURN, M.D., *Senior Physician (Surgeon).*
 EDWARD D. CHURCHILL, M.D., *Senior Physician (Surgeon).*
 G. ARNOLD RICE, M.D., *Senior Physician (Laryngologist).*

Report of the Superintendent.

To Dr. GEORGE H. BIGELOW, *Commissioner, Department of Public Health.*

I have the honor to submit the thirty-second annual report of the Rutland State Sanatorium for the year ending November 30, 1928.

During the year there has been expended \$303,447.99 for maintenance, a gross weekly per capita cost of \$16.2269. There has been expended from Special Ap-

propriation authorized by Chapter 398, Acts 1926 \$71.91; from Special Appropriation authorized by Chapter 79, Acts 1926, \$643.12; from Special Appropriations authorized by Chapter 127, Acts 1928, Item 596, Women Employees' Building, \$18,057.82; Item 597, Additional Fire Protection, \$213.82.

There has been collected from miscellaneous sources (the total of all collections) \$301,751.39, an increase of 2.43 per cent over the collections of last year. Deducting this amount from the gross maintenance expense leaves a net expense of \$1,696.60, a net weekly per capita cost of \$0.0907. There has been collected from private sources \$8,931.97; from cities and towns \$57,235.80; from Worcester County \$51,722.50; from Middlesex County \$154,115.00; from the Attorney General \$2,339.65; from the United States Veterans Bureau \$60.00; from the Tuberculosis Hospital District of Chelsea, Revere and Winthrop \$25,482.50.

Thirty-one cases were supported wholly or in part from private funds; forty-six by cities and towns; fifteen wholly by the State; one hundred and sixty by Middlesex County; fifty by Worcester County and twenty-four by the Tuberculosis Hospital District of Chelsea, Revere and Winthrop. There were thirty-four cases on which settlement had not been determined.

There were 353 patients in the sanatorium at the beginning of the year and 364 at the close. The largest number present at one time was 372 and the smallest 356. The daily average number of patients was 359.62 an increase of 2.60. There were 415 patients admitted during the year, 73 less than last year; 66 minimal, 131 moderately advanced, 204 far advanced, 8 unclassified, 5 hilum and 1 non-tuberculous. There were 237 admitted from cities and towns of over 25,000 population and 178 from cities and towns under 25,000 population. The average age of patients admitted was 35.79, an increase of 4.97. Including deaths there were 404 patients discharged, 94 less than last year. The average duration of residence was 262 days. Of those discharged 236 gained 2,774.50 pounds, an average gain of 11.75 pounds per person. Of the discharges there were 10 arrested cases, 7 more than last year, 12 apparently arrested cases, 6 less than last year, 157 quiescent cases, 47 less than last year, 60 improved, 53 unimproved and 18 not considered, the duration of treatment being less than one month. There were 4 discharged non-tuberculous. There were 90 deaths, 2 more than last year. There were 131,624 days of treatment, 1,310 more than last year.

The following table shows the classification on the application blank and our classification on admission:

	CLASSIFICATION ON APPLICATION BLANKS.		OUR CLASSIFICATION ON ADMISSION.		PER CENT.	
	1927.	1928.	1927.	1928.	1927.	1928.
Minimal	107	99	62	66	12.70	15.90
Moderately Advanced	282	241	162	131	33.20	31.57
Far Advanced	69	51	241	204	49.39	49.16
Unclassified	30	22	23	8	4.71	1.93
Hilum	—	2	—	5	—	1.20
Non-tuberculous	—	—	—	1	—	.24
	488	415	488	415	—	—

Laboratory Report. — The following is a report of the work done in the laboratory during the year: Urine examinations: Routine, 563; 24 hour specimens, 8; Total, 571. Sputum examinations for the tubercle bacilli: Positive, 2,280; No tubercle bacilli found, 4,031; Total, 6,311. Blood counts, 54; Blood cultures, 3; Blood examinations for coagulation time, 3; Widal reactions, 90; Examinations of milk for percentage of fat, 26; Fluids (Abdominal and Pleural) Chem. and Bact., 6; Guinea pig inoculations, 15; Guinea pig autopsies, 12; Examination of Rutland State Sanatorium Farm Pork for *Trichinella Spiralis*, 25; Cultures made for further examination for *Bacillus Typhosis*: From urine, 84; From feces, 84; Total, 168. Test for Ultra Violet Ray, 82; Occult Blood examinations, 1; Smears from eyes and throat for differentiation of organisms, 16. Blood drawn for Wassermann Test: Negative 404, Positive 9, Doubtful 10, Total 423.

Of the total number of patients remaining in the sanatorium Nov. 30, 1928 (364), 13 cases have reported no sputum, 51.10 per cent have positive sputum, and

45.33 per cent tubercle bacilli not found; 380 smallpox vaccinations; 331 triple typhoid inoculations; 770 X-Ray plates of chest and 55 X-Ray plates of teeth.

Lectures. — Twenty-four lectures in bacteriology were given to Nurses' Training School.

Dentistry. — The following is a summary of the dental work done during the year: Office Visits, 2,867; Treatments, 849; New Patients Examined, 387; Patients X-Rayed, 55; Mouth Washes, 245; Amalgam Fillings, 354; Cement Fillings, 190; Gutta Percha Fillings, 152; Porcelain Fillings, 205; Surgical Dressings, 3; Extractions, 412; Post Extractions, 372; Vincent's Disease Treated, 36; Gingivitis Cases Treated, 95; Trismus Cases, 1; Abscess Cases, 141; Stomatitis, 62; Bed Treatments, 58; Hemorrhages Checked, 5; Inlays, 21; Restorations, 23; Plates Repaired, 22; Crowns, 12; Extractions under Novocaine, 404; Extractions under Ethyl Chloride, 8; Prophylaxis, 241; Pulp Treatment, 10; Tuberculous Mouth, 1; Tuberculous Jaw, 1; Impacted Teeth Extracted, 18; Bridges Repaired, 4; Teeth Extracted at Bedside, 18; Mercurial Stomatitis, 1; Antrum Cases Treated, 2; Pyorrhoea Cases Treated, 118; Plates Trimmed, 14; Cysts Lanced, 6; Restoration made for Cleft Palate and Hair Lip, 1.

Consultation Clinics. — The following tables indicate the work of the consultation service, clinics, out-patients and others:

Consultation Clinics: Number of patients examined at the Worcester, Gardner, Framingham and Clinton Clinics, 237. Diagnosis: Tuberculosis, 102; Non-tuberculous, 63; Observation, 66; Hilum, 6.

Two hundred and thirty-seven Consultation cases reported for 270 examinations, and 27 ex-patients reported for 36 follow-up examinations, making a total of 306 examinations at the consultation clinics.

Number of patients examined: Once, 211; Twice, 20; Three times, 5; Four times, 1.

Number of ex-patients examined: Once, 21; Twice, 4; Three times, 1; Four times, 1.

Number of physicians referring patients, 89.

There were 13 patients admitted to the sanatorium following examinations at the consultation clinics.

Sanatorium — Out-patient clinic: Patients referred by physicians, 122; Patients examined at own request, 72; Total, 194. Ex-patients examined at own request, 120; Total, 314. Diagnosis: Tuberculous, 69; Non-tuberculous, 75; Observation, 47; Hilum, 3; Total, 194.

One hundred and ninety-four patients reported for 216 examinations and 120 ex-patients reported for 144 examinations, making a total of 360 examinations at the sanatorium.

Number of patients examined: Once, 176; Twice, 15; Three times, 2; Four times, 1.

Number of ex-patients examined: Once, 102; Twice, 12; Three times, 6.

Number of physicians referring patients to the sanatorium, 73.

There were 18 patients admitted to the sanatorium following examinations at the sanatorium.

There were 10 patients examined at other sanatoria. Diagnosis: Tuberculous, 8; Non-tuberculous, 2.

The total of all examinations made during the year, exclusive of routine work, was 676.

Artificial pneumothorax has been used as a therapeutic measure in a larger number of cases than in any previous year. The results in many instances are most striking, particularly in some cases with a considerable involvement of the contralateral lung. There are now 54 cases under treatment, 53 of which show distinct signs of improvement. There were 18 cases during the year on which treatment was discontinued for various reasons.

Thoracoplasty has been done upon two patients, the results of which at the present time appear most favorable. These patients were operated upon at the Massachusetts General Hospital. Arrangements have now been made for the admission of thoracic surgical cases to the Boston City Hospital. Dr. Edward D. Churchill has been appointed senior physician, non-resident, to take charge of the thoracic surgery.

PERSONNEL.

The following resignations from the Staff and appointments have been made during the year:

Dr. Leopold Balthazard, appointed assistant physician October 5, 1927, resigned February 29, 1928, to accept a position as physician to a mining company in Canada.

Dr. Antoine Dumouchel, appointed assistant physician June 1, 1927, resigned August 1, 1928, to enter private practice.

Dr. Jacob Kaminsky, a graduate of the University of Nebraska, was appointed assistant physician April 18, 1928.

Dr. Gabriel Nadeau, a graduate of the University of Montreal, was appointed an assistant physician August 15, 1928.

IMPROVEMENTS.

Construction of the women employees' new building authorized under chapter 127, Item 596, Acts of 1928, and the installation of additional fire service authorized under chapter 127, Item 597, Acts of 1928, are under way and it is expected all of this work will be completed early in the spring.

The Nurses' Home has been shingled with asbestos shingles to match those of the women employees' building.

Extensive repairs are under way consisting for the most part in the replacement of sills in many of the buildings.

TRAINING SCHOOL FOR NURSES.

The Training School for Nurses is now entering its twenty-first year. The following affiliations supplement the course given at the sanatorium: Cooley-Dickenson Hospital, obstetrics and surgery, Worcester City Hospital, pediatrics and medicine and Worcester State Hospital, mental diseases. There are 36 pupil nurses: 11 seniors, 10 intermediates, 6 juniors and 9 probationers.

The following have been awarded diplomas:

Mary Ellen Sullivan
Helen Bousfield
Anna Elizabeth Rasku
Veronica Anna L. Lubin

Alta Paige Magrath
Mary Louise Cushman
Celia Robbins
Serge Michael Raevsky

Paul Garabedian

One nurse affiliated from the Worcester State Hospital for six months.

RECOMMENDATIONS.

In order to comply with the recommendations made by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies, I recommend an appropriation of \$17,091.00 for the installation of sprinkler additions as follows:

	Heads.
Center Building	126
Assembly Building	49
Service Building	114
Connecting Passages	105
Ward L	227
Ward A	90
Ward B	87
Ward C	90
Ward D	90
Ward H	92
Ward E	51
Ward F	52
Ward I	19
Ward J	21
Ward N	22
Ward O	21
Infirmery	222
Attendants' Building	199
Nurses' Home	222
a total of 1,899 heads at \$9.00 per head, \$17,091.00.	

Following a survey made by the Division of Sanitary Engineering, I recommend an appropriation of \$9,390.90 for improvements in the water supply system as follows:

A. Furnishing and replacing one 6-inch and two 8-inch gates in present pipe line northwest of service building.

B. Furnishing and installing 3,500 feet of 2½-inch cement line galvanized wrought iron pipe from center buildings to farm buildings with a 2½-inch meter.

C. Furnishing and installing a 3-inch meter and a 2½-inch meter on the line supplying the eastern part of the sanatorium.

I recommend the appropriation of \$8,000.00 for furnishings for the women employees' building authorized under Chapter 127, Acts 1928.

ACKNOWLEDGMENTS.

Again I wish to acknowledge with gratitude the good work carried on by the Chaplains who have served us another year: The Reverend Father McNamara, the Reverend Father Smith, the Reverend Mr. French and Rabbi Bloom.

The co-operation, loyalty and spirit of the employees, as in the past, have been all that one could desire.

It is perhaps needless to say that I am deeply grateful for your confidence, consideration and counsel.

Respectfully,

ERNEST B. EMERSON,
Superintendent.

VALUATION.
Land.

Grounds, 46.867 acres	\$17,321 30	
Lawns and buildings, 36.867 acres.		
Roads, 10.00 acres.		
Woodland, 93.30 acres	3,324 60	
Mowing, 60.40 acres	6,040 00	
Tillage, 43.44 acres	4,855 00	
Tillage, 37.88.		
Garden, 5.56.		
Orchard, .99 acres	198 00	
Pasture, 84.88 acres	3,340 15	
Waste and Miscellaneous, 34.85 acres	1,819 75	
Rough Pasture, 4.35.		
Meadow Swamp, 24.02.		
Sewer Beds, 5.98.		
Coal Trestle, .50.		
Sewerage System	15,508 32	
		\$52,407 12

Buildings.

Institution Buildings	\$543,394 74	
Farm, Stable and Grounds	34,125 00	
Miscellaneous	93,644 92	671,164 66
		\$723,571 78
Present value of all personal property as per inventory of November 30, 1928		102,616 55
Grand Total		\$826,188 33

POPULATION.

	Males.	Females.	Totals.
Number received during the year	224	191	415
Number passing out of the institution during the year	217	187	404
Number at the end of fiscal year in the institution	185	179	364
Daily average attendance (number of inmates actually present during the year)	182.74	176.88	359.62
Average number of employees and officers during the year	124.36	72.28	196.64

EXPENDITURES.

Current expenditures:	
1. Personal Services	\$159,707 04
2. Clothing	232 41
3. Subsistence	72,852 17
4. Ordinary repairs	7,240 05
5. Office, domestic and outdoor expenses	61,779 06
	\$301,810 73
Extraordinary expenses:	
1. Permanent improvements to existing buildings	1,637 26
	\$303,447 99

Summary of Current Expenses.

Total expenditure	\$303,447 99
Deducting extraordinary expenses	1,637 26
	<hr/>
	\$301,810 73
Deducting amount of sales	1,158 06
	<hr/>
	\$300,652 67

Dividing this amount by the daily average number of patients 359.62, gives a total cost for the year of \$315.76, equivalent to an average weekly net cost of \$16.0773.

Statistical Tables.TABLE 1. *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in sanatorium Nov. 30, 1927	178	175	353
Patients admitted Dec. 1, 1927, to Nov. 30, 1928, inclusive	224	191	415
Patients discharged Dec. 1, 1927, to Nov. 30, 1928, inclusive	217	187	404
Patients remaining in sanatorium Nov. 30, 1928	185	179	364
Daily average number of patients	182.74	176.88	359.62
Deaths (included in number discharged)	50	40	90

TABLE 2. *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	103	99	202
Married	108	86	194
Widowed	9	6	15
Divorced	3	—	3
Legally Separated	1	—	1
	<hr/>	<hr/>	<hr/>
	224	191	415

TABLE 3. *Ages of Patients Admitted.*

	Males.	Females.	Totals.	Percentage.
Under 14 years	—	—	—	—
14 to 20 years	15	19	34	8.19
20 to 30 years	80	111	191	46.03
30 to 40 years	58	41	99	23.86
40 to 50 years	46	9	55	13.25
Over 50 years	25	11	36	8.67
Average age	34.16	28.52	35.79	—
	<hr/>	<hr/>	<hr/>	<hr/>
	224	191	415	—

TABLE 4. *Nativity and Parentage of Patients Admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	110	33	35	125	23	31	235	56	66
Other New England States	11	9	10	8	12	8	19	21	18
Other States	8	14	9	7	12	4	15	26	13
Total Native	129	56	54	140	47	43	269	103	97
Other Countries (25):	95	166	170	51	137	142	146	303	312
Unknown	—	2	—	—	7	6	—	9	6
Grand Totals	224	224	224	191	191	191	415	415	415

TABLE 5. — *Residence of Patients Admitted.*

PLACE. Number.	PLACE. Number.	PLACE. Number.
Arlington, 8	Brookfield, 1	Dudley, 2
Ashburnham, 1	Cambridge, 8	Everett, 15
Ashland, 1	Charlton, 1	Fall River, 8
Athol, 2	Chartley, 1	Fairview, 1
Ayer, 2	Chelsea, 27	Foxborough, 1
Belmont, 2	Chicopee, 2	Framingham, 2
Blackstone, 1	Clinton, 3	Freetown, 1
Boston, 65	Concord, 1	Gardner, 7
Brockton, 1	Dracut, 1	Grafton, 3

TABLE 5. — *Residence of Patients Admitted* — Concluded.

PLACE.	Number.	PLACE.	Number.	PLACE.	Number.
Greenwich Village, 1		Milton, 1		Townsend, 3	
Holden, 1		Natick, 4		Uxbridge, 1	
Holyoke, 4		Newton, 7		Wakefield, 6	
Hopedale, 1		Northfield, 1		Waltham, 15	
Hopkinton, 1		Northbridge, 1		Ware, 1	
Hubbardston, 2		Oxford, 1		Watertown, 11	
Hudson, 6		Reading, 2		Waverley, 1	
Lawrence, 1		Revere, 6		Webster, 8	
Leicester, 1		Rochdale, 1		Westfield, 1	
Leominster, 6		Rutland, 3		Westford, 1	
Lexington, 2		Saxonville, 1		Westminster, 1	
Littleton, 1		Shrewsbury, 1		Weymouth, 1	
Lowell, 3		Somerville, 19		Whitinsville, 3	
Lynn, 1		Southbridge, 10		Winchendon, 3	
Malden, 24		Spencer, 1		Winchester, 4	
Marlborough, 14		Springfield, 12		Winthrop, 1	
Maynard, 3		Stoneham, 3		Woburn, 4	
Medford, 9		Stow, 1		Worcester, 10	
Melrose, 7		Sutton, 3		Wrentham, 1	
Merrimac, 1		Templeton, 1		Total, 415	
Milford, 3					

TABLE 6. — *Occupation of Cases Admitted.*

	Males.	Females.		Males.	Females.
Agent, Advertising . . .	1	—	Janitor . . .	2	—
Agent, Purchasing . . .	1	—	Kitchen Helper . . .	1	—
Attendant . . .	—	2	Knitter, Machine . . .	1	—
Barber . . .	3	—	Laborer . . .	13	—
Bookkeeper . . .	2	2	Laundress . . .	—	1
Bookkeeper and Stenographer . . .	—	1	Loomfixer . . .	3	—
Broker, Insurance . . .	1	—	Machinist . . .	3	—
Bundle Girl . . .	—	1	Maid, Nurse . . .	—	1
Bus Boy . . .	1	—	Mailer . . .	1	—
Butcher . . .	3	—	Manager . . .	5	—
Butcher's Helper . . .	1	—	Matron . . .	—	1
Captain of Tug Boat . . .	1	—	Mechanic . . .	2	—
Carder . . .	2	—	Merchant . . .	3	—
Carpenter . . .	8	—	Messenger . . .	1	—
Cashier . . .	1	2	Metal-lather . . .	1	—
Chauffeur . . .	9	—	Metal-polisher . . .	1	—
Chef . . .	1	—	Metal-worker . . .	2	—
Cigar Maker . . .	1	—	Millhand . . .	2	2
Clerk . . .	11	13	Milliner . . .	—	1
Combmaker . . .	1	—	Moulder . . .	3	—
Conductor . . .	1	—	Mounter, Stone . . .	1	—
Coppersmith . . .	1	—	Musician . . .	1	—
Cook . . .	2	1	No Occupation . . .	—	7
Counter Girl . . .	—	1	Nurse, Graduate . . .	1	10
Dancer . . .	—	1	Nurse, Practical . . .	—	2
Electrician . . .	4	—	Nurse, Student . . .	—	3
Engineer, Hoisting . . .	1	—	Oilier . . .	1	—
Engraver, Photo . . .	1	—	Operator, Comptometer . . .	—	—
Estimator, Building . . .	1	—	Operator, Telephone . . .	—	2
Factory . . .	25	18	Painter . . .	5	—
Farmer . . .	1	—	Painter, Auto . . .	1	—
Filterman . . .	1	—	Paperhanger . . .	1	—
Fish-cutter . . .	1	—	Perfume Finisher . . .	—	1
Florist . . .	1	—	Porter . . .	1	—
Foreman . . .	3	—	Pressworker . . .	1	—
Forester . . .	1	—	Printer . . .	3	—
Freight Handler . . .	1	—	Professor . . .	1	—
Gardener . . .	1	—	Proprietor of Turkish Baths . . .	1	—
Gas-welder . . .	1	—	Repairman . . .	2	—
General Work . . .	7	2	Riveter . . .	1	—
Glassworker . . .	1	—	Ropemaker's Helper . . .	1	—
Granite Cutter . . .	1	—	Sales Engineer . . .	1	—
Hairdresser . . .	—	1	Saleslady . . .	—	3
Housewife . . .	—	71	Salesman . . .	10	—
Housework . . .	—	12	Seamstress . . .	—	1
Inspector, Moth . . .	1	—	Secretary . . .	—	4
Inspector, P. O. . .	1	—	Signal Man . . .	1	—
Iron Worker . . .	1	—	Steamfitter's Helper . . .	1	—
			Stenographer . . .	1	12

TABLE 6. — *Occupation of Cases Admitted* — Concluded.

	Males.	Females.		Males.	Females.
Steward	1	—	Truckman	1	—
Student	12	4	Typist	—	1
Tailor	2	—	Waiter	2	—
Teacher	1	3	Watchmaker	1	—
Teamster	3	—	Watchman	2	—
Technician	1	—	Weaver	4	2
Telegrapher	—	1	Well Driller	1	—
Teller	2	—	Window-washer	1	—
Timekeeper	1	—	Wiremaker	1	—
Tinsmith	1	—			

Total number of occupations, 116; Total number of males, 224; Total number of females, 191; Total, 415.

TABLE 7. — *Stage of Disease at Admission.*

	Males.	Females.	Totals.	Percentage.
Minimal	29	37	66	15.91
Moderately Advanced	74	57	131	31.56
Far Advanced	115	89	204	49.16
Unclassified	3	5	8	1.92
Hilum	3	2	5	1.21
Non-tuberculous	—	1	1	.24
Totals	224	191	415	—

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Arrested	3	7	10	2.48
Apparently Arrested	8	4	12	2.98
Quiescent	82	75	157	38.86
Improved	36	24	60	14.85
Unimproved	28	25	53	13.12
Deaths	50	40	90	22.27
Non-tuberculous	1	3	4	.99
Not Considered	9	9	18	4.45
	217	187	404	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Fe- males.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Fe- males.	Totals.
Under 1 month	—	—	—	6	3	9
1 to 2 months	—	—	—	7	5	12
2 to 3 months	1	—	1	5	6	11
3 to 4 months	—	—	—	3	1	4
4 to 5 months	1	—	1	5	1	6
5 to 6 months	1	1	2	2	6	8
6 to 7 months	3	1	4	—	3	3
7 to 8 months	—	2	2	4	—	4
8 to 9 months	—	—	—	1	—	1
9 to 10 months	2	—	2	2	2	4
10 to 12 months	2	6	8	4	3	7
12 to 18 months	11	4	15	7	5	12
18 to 24 months	2	5	7	1	2	3
Over 2 years	27	21	48	3	3	6
	50	40	90	50	40	90

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Pulmonary Tuberculosis	48	38	86
Pulmonary Abscess	1	—	1
Shock following administration of Arsphenamine	1	—	1
Myocardial Failure	—	1	1
Chronic Endocarditis	—	1	1
	50	40	90

WESTFIELD STATE SANATORIUM.

RESIDENT OFFICERS.

HENRY D. CHADWICK, M.D., *Superintendent.*
 ROY MORGAN, M.D., *Assistant Superintendent.*
 HEMAN B. CHASE, M.D., *Senior Physician.*
 ERNEST LANDRY, M.D., *Assistant Physician.*
 GEORGE E. CROWELL, D.M.D., *Dentist.*
 EMILY B. MORGAN, *Superintendent of Nurses.*
 JOSEPHINE E. FRENCH, *Senior Bookkeeper and Treasurer.*
 JOHN E. KINSELLA, *Steward.*
 BENJAMIN J. SANDIFORD, *Chief Power Plant Engineer.*
 WILLIAM G. ATKINSON, *Head Farmer.*

NON-RESIDENT OFFICER.

M. ARCHIBALD DECHTER, M.D., *Senior Physician (Consultant Eye, Ear and Throat).*

To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the nineteenth annual report of the Westfield State Sanatorium for the year ending November 30th, 1928.

During the year there has been expended \$248,947.77 for Maintenance, a gross weekly per capita cost of \$16.782.

There has been collected from miscellaneous sources \$87,589.30. Deducting this amount from the gross maintenance expense, leaves a net expense of \$161,358.47, or a net weekly per capita cost of \$10.877. There has been collected from private funds \$8,204.90; from cities and towns \$74,488.12. 21 cases were supported wholly or in part from private funds; 178 by cities and towns; 50 wholly by the state; 21 by the Department of Public Welfare; 42 status undetermined; 2 part city and part state.

We had 275 patients at the beginning of the year and 296 at the close. Our daily average was 285.27. The largest number present was 307, the smallest 250. Total of cases admitted was 314. These were classified as shown in the following table:

No Disease	11	Pott's Disease	1
Malnutrition	21	Tuberculous Dactylitis	1
Diseased Tonsils	3	Multiple Abscesses	1
Adenitis	9	Tuberculous Choroiditis	1
Hilum Tuberculosis	160	Chronic Otitis Media	1
Minimal	25	Mediastinal Tumor	1
Moderately Advanced	19	Osteomyelitis	2
Advanced	39	Goitre	1
Pulmonary Abscess	5	Impetigo Contagiosa	1
Bronchiectasis	2	Tuberculous Mesenteric Glands	1
Asthma	3	Unclassified	1
Pleurisy with Effusion	3		
Cardiac Disease	2		
			314

Two hundred and twelve cases were admitted from cities and towns of over 25,000 population; 102 from cities and towns of less than 25,000. The average age of patients was 11.48 years. There were 293 discharges. The average length of stay of patients discharged, including deaths, was 345.6 days. Of these, 40 were Apparently Well; 157 Apparently Arrested; 44 Improved; 21 Unimproved; 17 were not considered as they stayed less than 30 days. There were 14 deaths. Of those discharged, 271 gained 3,224.2 pounds, or an average of 11.8 pounds. There were 104,512 hospital days of treatment.

COMMENT.

Our gross weekly per capita cost has been 85 cents less and our total receipts have been \$1,971.63 more than in 1927. The number of private patients decreased from 39 to 21 and those paid for by cities and towns increased from 138 to 178. The number of state cases decreased from 67 to 50. The average age of patients admitted was lower than ever before, namely: 11.5 years.

MEDICAL WORK.

Our experience in the past has shown that it is rare for a boy or girl with pulmonary tuberculosis that has reached the stage where tubercle bacilli are found

in the sputum to recover from the disease. This last year we have lengthened the period of bed treatment even when there has been no fever or other symptoms of active disease and the patient has been kept in bed for a year or more. We are beginning to see good results in cases that we have previously considered hopeless. We feel that continuous bed treatment for a long period — one, two or even three years — may result in curing some boys and girls who otherwise would die with tuberculosis. As a result of this longer period of enforced rest, we have about one-third of our patients in bed all the time. When we take into consideration the fact that only 83 of the 314 patients admitted were the pulmonary type, it is a high percentage.

The out-patient work has increased steadily each year. Our records for five years show the number of out-patients examined as follows:

1924	241
1925	396
1926	441
1927	743
1928	1,077

This last year 173 physicians from 33 cities and towns in Massachusetts and four physicians from four cities outside of Massachusetts sent us 589 patients for examination. Twenty-six hospitals and organizations referred 148 persons for diagnosis. This diagnostic clinic takes much of one physician's time. We are in great need of better accommodation for this work. Doctors now realize that an X-ray of the chest is a necessity for early diagnosis and to record progress of the disease. For this reason this department of sanatorium work will become more and more important. We need better equipment and more suitable rooms for receiving and examining these out-patients. I hope provision for this work will be made in the near future.

The activities of the Hampden County Tuberculosis Association with whom we closely co-operate have resulted in the examination of a large number of children in the small towns of the county. Twenty-two such clinics have been held and the examinations were made by the sanatorium medical staff.

	Positive.	Negative.	Suspicious.	Re-examination.	Total.
1. Consultation Clinics	3	7	18	16	44
2. Examination Clinics	9	756	39	326	1,130
3. Out-Patients	132	520	113	312	1,077
	144	1,283	170	654	2,251

This shows that 144 new cases of tuberculosis were diagnosed in these clinics, or 6.3 per cent of the total number examined.

Out-patient X-rays 1,340

Our medical staff has been strengthened this year by the appointment of Dr. M. A. Dechter of Westfield as a Consultant in the diseases of the Eye, Ear and Throat. Also Dr. R. N. Hatt, Superintendent of the Shriners' Hospital of Springfield, has been kind enough to see several orthopedic cases that we have referred to him.

PUBLICITY.

The publicity required in the development of the Ten-Year Program necessitated my addressing many meetings of Parents and Teachers Associations, Service Clubs, Women's Clubs and local medical societies. I also lectured on the subject of Juvenile Tuberculosis at the Hygiene Conferences conducted by the Department of Education and Division of Hygiene at five State Normal Schools. Altogether there were 28 of these public meetings. I read a paper prepared by Dr. David Zacks and myself before The American Climatological and Clinical Association at Washington, D. C., on "The Incidence of Tuberculous Infection in School Children." I also read a paper on the subject of Juvenile Tuberculosis at the Metropolitan Life Insurance Company Sanatorium, Mount McGregor, N. Y., to the County Society, and at Louisville, Ky., before the Jefferson County Medical Society. I took part in a symposium on the "Interpretation of X-Ray Films of Children" at the Eastern Section of the American Sanatorium Association at Norwich, Conn.

DENTIST'S REPORT.

The following table shows the work done in the dental clinic during the year: Examinations, 1,172; Prophylactic Treatments, 904; Fillings — Permanent and Temporary Teeth, 1,116; Extractions: Temporary, 165, Permanent, 78; Treatments, 546; Restorations, 55; X-Rays, 12; Irrigations, 17; Total operations for the year, 4,065.

SANATORIUM SCHOOL.

Average Daily Attendance December, 1927, to December, 1928.

Grade I	21.67
Grade II	16.38
Grade III	19.92
Grade IV	16.33
Grade V	25.13
Grade VI	22.18
Grade VII	18.62
Grade VIII	18.15
Manual Training	25.18
<hr/>	
Total Average	183.56
Total Enrollment	401

IMPROVEMENTS MADE DURING THE YEAR.

The appropriation for improvements to the sewerage system enabled us to lay new 10-inch mains from the buildings to the sewage beds, and to connect up the school buildings with this disposal system. Clean-outs have been built at each junction point and provision made to care for the sewage from the proposed new dormitory.

An appropriation for additional sprinklers for fire protection is available and these will be installed within a few months.

A concrete swimming pool 75' x 25' of sufficient depth for diving was completed in the fall.

A two-room addition has been made by reconstructing the north porch of the Children's Ward. One of these rooms will be used as an operating room and the other for ultra violet ray treatments.

New refrigerator rooms have been built to replace the old ones.

RECOMMENDATIONS.

We are again asking for a new dormitory for employees. This is an urgent need as many of our employees are in crowded quarters and not enough rooms are available after putting beds in every conceivable space. Several employees are obliged to room in Westfield, several miles away. An item in our budget provides for housing 40 employees and I sincerely hope that the appropriation for the erection of this building will be granted.

The increased out-patient medical work demands better and larger quarters. I would propose that the lower floor of the Superintendent's apartment in the Administration Building be remodeled for this purpose, the upper floor to be used for the medical staff. This is a very convenient location for patients to come both from the wards and from the outside. If this plan is carried out, the Superintendent should be provided with a separate house so that his family could be assured of the privacy that can be had in no other way.

ACKNOWLEDGMENTS.

To the Catholic, Protestant and Jewish Clergymen I wish to express my gratitude for their ministrations to the patients to whom they have given much encouragement and consolation.

To the Knights of Columbus of Westfield we are indebted for their annual Christmas entertainment at which they distribute gifts to each patient. Their show is one of the most appreciated events of the year.

The Westfield Normal School also gives at least one entertainment each year.

To them and to individuals who have contributed money and gifts for the children, I wish to express my heartfelt thanks.

We have had but two resignations from our staff of resident officers and fewer changes among the other employees than usual. For this evidence of satisfaction and for their efficient work during the year, I am very grateful.

Respectfully submitted,

HENRY D. CHADWICK,
Superintendent.

VALUATION.

Land.

Grounds:		
Lawns and Buildings, 26.8 acres	\$5,235 00	
Woodland, 95.6 acres	4,664 00	
Mowing, 35.6 acres	2,670 00	
Tillage, 30.6 acres	2,187 50	
Orchard, 2.0 acres	400 00	
Pasture, 65.6 acres	1,049 50	
Waste and miscellaneous, 10.6 acres	380 50	
266.7 acres	\$16,586 50	
Sewerage System	14,524 82	
Total		\$31,111 32

Buildings.

Institution Buildings	\$208,402 29	
Farm, Stable and Grounds	26,920 00	
Miscellaneous	87,733 73	
		323,056 02
Total		\$354,167 34
Present value of all personal property as per inventory of November 30, 1928		117,850 09
Grand Total		\$472,017 43

POPULATION.

	Males.	Females.	Totals.
Number received during the year	161	153	314
Number passing out of the Institution during the year	139	154	293
Number at end of the fiscal year in the Institution	144	152	296
Daily average attendance (number of inmates actually present during the year)	138.08	147.19	285.27
Average number of employees and officers during the year	82	47	129

EXPENDITURES.

Current Expenditures:		
1. Salaries and wages	\$130,773 79	
2. Clothing	3,445 89	
3. Subsistence	46,050 04	
4. Ordinary Repairs	7,478 76	
5. Office, domestic and outdoor expenses	53,594 95	\$241,343 43

Extraordinary Expenses:		
1. Permanent improvements to equipment existing buildings	7,604 34	
		\$248,947 77

Summary of Current Expenses.

Total expenditure	\$248,947 77	
Deducting extraordinary expenses	7,604 34	
		\$241,343 43
Deducting amount of sales		4,874 74
		\$236,468 69

Dividing this amount by the daily average number of patients 285.27, gives a cost for the year of \$828.93, equivalent to an average weekly net cost of \$15.940.

Statistical Tables.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1927, to Nov. 30, 1928, inclusive	161	153	314
Number of patients discharged Dec. 1, 1927, to Nov. 30, 1928, inclusive	139	154	293
Number of deaths (including those in previous items)	5	9	14
Number in Sanatorium Dec. 1, 1927	122	153	275
Number remaining Nov. 30, 1928	144	152	296

TABLE 2. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	160	153	313
Married	1	—	1
	161	153	314

TABLE 3. — *Ages of Patients Admitted.*

	Males.	Females.	Totals.
1 to 13 years	103	99	202
14 to 20 years	57	52	109
21 to 30 years	—	2	2
61 to 80 years	1	—	1
	161	153	314

TABLE 4. — *Nativity and Parentage of Patients Admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	133	39	39	125	43	50	258	82	89
Other N. E. States	10	14	15	9	16	13	19	30	28
Other States	7	10	6	8	7	4	15	17	10
Total Natives	150	63	60	142	66	67	292	129	127
Other Countries:									
Austria	—	4	4	—	2	4	—	6	8
Canada	4	13	18	7	19	13	11	32	31
Cape Verde Islands	—	1	1	—	—	—	—	1	1
Denmark	—	1	—	—	—	—	—	1	—
England	—	3	2	—	3	2	—	6	4
Finland	—	—	—	—	2	2	—	2	2
France	1	1	1	—	—	—	1	1	1
Germany	—	—	1	—	—	—	—	—	1
Greece	—	2	2	—	3	2	—	5	4
Ireland	—	14	17	1	12	16	1	26	33
Italy	1	18	17	1	20	22	2	38	39
Norway	1	1	2	—	—	—	1	1	2
Poland	—	12	11	—	9	9	—	21	20
Portugal	—	1	1	—	2	2	—	3	3
Russia	—	7	9	1	4	4	1	11	13
Scotland	—	—	—	—	3	3	—	3	3
Spain	—	1	1	—	1	—	—	2	1
Sweden	—	1	1	—	—	—	—	1	1
Syria	—	—	—	—	2	2	—	2	2
West Indies	—	1	—	—	—	—	—	1	—
	7	81	88	10	82	81	17	163	169
Unknown	4	17	13	1	5	5	5	22	18
	11	98	101	11	87	86	22	185	187
	150	63	60	142	66	67	292	129	127
	161	161	161	153	153	153	314	314	314

TABLE 5. — *Residence of Patients Admitted.*

Adams, 3	Everett, 2	Lynn, 3
Agawam, 1	Fall River, 1	Malden, 2
Athol, 3	Fitchburg, 12	Marlborough, 4
Barre, 1	Foxborough, 1	Milford, 1
Belchertown, 1	Greenfield, 2	Millbury, 1
Boston, 69	Haverhill, 2	Montague, 1
Boylston, 1	Holden, 1	Natick, 2
Brockton, 2	Holyoke, 8	Newton, 2
Cambridge, 14	Hubbardston, 1	New Bedford, 1
Canton, 2	Hudson, 2	North Adams, 4
Chelsea, 2	Kingston, 1	Northampton, 2
Chicopee, 8	Lancaster, 4	Orange, 2
Concord, 1	Leominster, 9	Oxford, 3
East Longmeadow, 1	Lowell, 1	Palmer, 2

TABLE 5. — *Residence of Patients Admitted* — Concluded.

Pittsfield, 6	Stockbridge, 1	West Springfield, 7
Quincy, 22	Stoughton, 1	Weymouth, 1
Revere, 3	State Minor Wards, 21	Wilbraham, 1
Rutland, 1	Taunton, 2	Winchendon, 1
Salem, 2	Wakefield, 1	Winthrop, 1
South Hadley, 1	Ware, 1	Woburn, 1
Somerville, 3	Watertown, 1	Worcester, 10
Southbridge, 1	Webster, 6	Total, 314
Springfield, 28	Westfield, 5	

TABLE 6. — *Occupation of Cases Admitted.*

	Males.	Females.	Totals.
At Home	11	8	19
Attendant	—	—	—
Barber	1	—	1
Bellboy	1	—	1
Clerk	3	—	3
Factory	3	5	8
Laundry	—	1	1
Laborer	1	—	1
Mechanic	1	—	1
Messenger	4	—	4
Nurse	—	1	1
Nursemaid	—	1	1
Orderly	2	—	2
Printer	2	—	2
School	132	137	269
	161	153	314

TABLE 7. — *Stage of Disease on Admission.*

	Males.	Females.	Totals.	Percentage.
No Disease	4	7	11	3.5
Malnutrition	10	11	21	6.69
Diseased Tonsils	—	3	3	.96
Adenitis	7	2	9	2.87
Hilum Tuberculosis	92	68	160	50.93
Minimal	14	11	25	7.96
Moderately Advanced	6	13	19	6.05
Advanced	15	24	39	12.42
Pulmonary Abscess	1	4	5	1.58
Bronchiectasis	—	2	2	.64
Asthma	2	1	3	.96
Pleurisy with Effusion	3	—	3	.96
Cardiac Disease	1	1	2	.64
Pott's Disease	—	1	1	.32
Tuberculosis Dactylitis	1	—	1	.32
Multiple Abscesses	1	—	1	.32
Tuberculosis Choroiditis	1	—	1	.32
Chronic Otitis Media	—	1	1	.32
Mediastinal Tumor	—	1	1	.32
Osteomyelitis	1	1	2	.64
Goitre	—	1	1	.32
Impetigo Contagiosa	—	1	1	.32
Tuberculous Mesenteric Glands	1	—	1	.32
Unclassified	1	—	1	.32
	161	153	314	100.00

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Apparently Well	16	24	40	13.66
Apparently Arrested	85	72	157	53.60
Improved	20	24	44	15.01
Unimproved	5	16	21	7.17
Not Considered	8	9	17	5.81
Died	5	9	14	4.75
	139	154	293	100.00

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Fe- males.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Fe- males.	Totals.
Under 1 month	—	—	—	1	—	1
1 to 2 months	—	—	—	1	—	1
2 to 3 months	—	—	—	—	—	—
3 to 4 months	—	—	—	—	1	1
4 to 5 months	1	—	1	—	1	1
5 to 6 months	—	—	—	—	—	—
6 to 7 months	—	—	—	—	—	—
7 to 8 months	—	—	—	1	2	3
8 to 9 months	—	—	—	—	—	—
9 to 10 months	—	1	1	1	—	1
10 to 12 months	—	1	1	—	—	—
12 to 18 months	3	3	6	1	2	3
18 to 24 months	—	1	1	—	—	—
Over 2 years	1	3	4	—	3	3
	5	9	14	5	9	14

TABLE 10. — *Causes of Death.*

CAUSE.	Males.	Females.	Totals.
Pulmonary Tuberculosis	4	9	13
Heart Disease	1	—	1
	5	9	14

PONDVILLE HOSPITAL.

RESIDENT OFFICERS.

LYMAN A. JONES, M.D., *Superintendent.*
 VALMORE A. PELLETIER, M.D., *Senior Physician.*
 CHARLES E. DUMAS, M.D., *Assistant Physician.*
 EMANUEL KLINE, D.M.D., *Dentist.*
 VERONICA M. BEAUREGARD, *Superintendent of Nurses.*
 JENNIE F. DIXON, *Social Service Worker.*
 ANNE D. McLAUGHLIN, *Laboratory Technician.*
 MARION MCKENZIE, *Senior Bookkeeper and Treasurer.*
 ERNEST L. GAGE, *Chief Power Plant Engineer.*
 MAY E. DONOVAN, *Head Housekeeper.*

NON-RESIDENT OFFICERS.

ERNEST M. DALAND, M.D., *Chief of Visiting Staff.*
 ISAAC GERBER, M.D., *Senior Physician (Radiologist).*
 HENRY JACKSON, M.D., *Senior Physician (Internist).*
 ROGER GRAVES, M.D., *Senior Physician (Urologist).*
 J. VINCENT MEIGS, M.D., *Senior Physician (Gynecologist).*
 D. CROSBY GREENE, M.D., *Senior Physician (Laryngologist).*
 CARL H. ERNLUND, M.D., *Senior Physician (Assistant Laryngologist).*
 ARTHUR GREENWOOD, M.D., *Senior Physician (Dermatologist).*
 SHIELDS WARREN, M.D., *Senior Physician (Pathologist).*
 LAWRENCE SOPHIAN, M.D., *Senior Physician (Assistant Pathologist).*
 JOHN S. HODGSON, M.D., *Senior Physician (Neurologist).*
 RICHARD H. NORTON, D.M.D., *Senior Physician (Oral Surgeon).*
 GRANTLEY W. TAYLOR, M.D., *Senior Physician (Surgeon).*
 JAMES C. HUDSON, A.M., *Physicist.*

To DR. GEORGE H. BIGELOW, *Commissioner, Department of Public Health.*

I have the honor to submit the second annual report of the Pondville Hospital (Norfolk), P. O. Wrentham, Mass., for the year ending Nov. 30, 1928. This is the first full year for which the hospital has been in operation.

During the year, for maintenance there was expended \$169,552.01, representing a gross weekly per capita cost of \$48.18. There were collected from miscellaneous sources \$28,407.12 (total of all collections). Of this sum \$12,146.39 came from private sources, \$15,502.50 came from cities and towns, \$16.25 from the State Board of Retirement, and from sales \$741.98.

Deducting the above total collections from the maintenance expense leaves a net expense of \$141,144.89, equivalent to a net weekly cost per capita of \$40.11.

Four hundred and eight patients were supported by private funds, 225 by cities and towns, 54 by the state, leaving the status of 2 still to be determined.

From special appropriations, funds have been expended as follows:

For reconditioning the cold storage plant, authorized by Acts of 1928, chapter 127 (\$2,800), \$1,892.30.

For relaying water mains, authorized by Acts of 1928, chapter 127 (\$2,000), \$1,849.51.

For additional fire protection, authorized by Acts of 1928, chapter 127 (\$14,000), \$7,777.38.

For the care of radium, authorized by Acts of 1927, chapter 328 (\$10,000), \$4,001.87.

On November 30, 1927, 40 patients remained in the hospital; during the year there were 689 admissions. Of these 174 represented readmissions. Patients were received from 133 cities and towns. Patients were received also from six other state institutions. Eighty patients remained in the hospital at the end of the year.

Discharges during the year numbered 649; 27 were relieved, 237 improved, the same, 110, not improved, 95, and 180 died. There were 83 autopsies.

The average stay in the hospital was 34.48 days per patient. The smallest number in the hospital on any one day was 28; the largest number 87. The average number per day was 67.67.

The weekly clinic at the hospital was continued through the year with 51 clinics held. Visits to the clinic numbered 1,333, with an average attendance of 26.09. First visits to the clinic numbered 431.

One hundred and thirty-three clinic patients subsequently entered the hospital.

X-Ray and Radium. — Diagnostic X-Ray plates taken 2,076; Fluoroscopic examinations 141; X-Ray treatments given 1,122; Radium treatments 356.

Operations. — There have been 355 operations. In addition there were esophagoscopies 3; cystoscopies 26; and proctoscopies 3.

Anesthesias. — An anesthetic was given 389 times.

Laboratory Report. — Since June, 1928, a full-time laboratory technician has been employed. This has made possible a substantial increase in laboratory work. Urine analyses, blood counts and Wassermann tests are now taken on all patients. Prospective donors for transfusion cases have been grouped in 52 instances. Co-operative arrangements have been made through the Department of Correction and the Superintendent at the Prison Colony whereby the prisoners at the near-by colony may volunteer to serve as donors.

Changes in Personnel. — During the year additions to the visiting staff were made, as follows:

Grantley W. Taylor, M.D., Assistant Visiting Surgeon.

Dr. Shields Warren, Visiting Pathologist.

Dr. Lawrence Sophian, Assistant Visiting Pathologist.

Dr. Carl Ernlund, Assistant Visiting Laryngologist.

Dr. John S. Hodgson, Visiting Neurologist.

Dr. Emanuel Kline, Dentist.

Early in the year, Mr. Cesare Scagliarini, owing to illness, relinquished the position of steward; subsequently the position was abolished. Dr. John F. Kellogg, Jr., and Dr. James I. Knott completed their services. They were followed by Dr. Wylis F. Collins and Dr. John Frost, who served temporarily till the appointment of Dr. Valmore A. Pelletier and Dr. Charles E. Dumas as resident physicians. Dr. Shields Warren was appointed visiting pathologist, following the death of Dr. Homer Wright. Dr. Lawrence Sophian was appointed assistant visiting pathologist.

A social service worker, Miss Esther Shannon, was added to the staff early in the year. Her resignation was followed by the appointment of Miss Jennie F. I. Dixon in her stead.

The position of bacteriologist (bacterio chemist) was established in June. For several months the position was filled by Miss Mary P. Hunter, who was followed by Miss Anne D. McLaughlin.

Improvements.—During the year much needed refrigerating facilities were provided through the establishing of electrical refrigeration in three of the dismantled chambers at the store room.

The old 2½-inch wrought-iron pipe installed when the hospital was built, carrying water from the well to the hospital grounds, was replaced by a six-inch cast-iron pipe.

Additional fire protection was furnished by the erection of a storage tank with a capacity of 100,000 gallons; by the installation of a standard underwriter's fire pump, and the installation of additional hydrants. Funds were requested in the budget to complete the fire protection planned, by the installation of sprinklers in certain buildings now without such protection.

Under advice kindly given by representatives of the Department of Public Works, roads were improved by the building of catch basins and drains and by covering portions of the roads with gravel taken from the hospital's own pits. A further sum has been requested for completing this work.

Additional apparatus has been installed in the laboratory. Frozen section apparatus was supplied together with a metabolism outfit and the necessary reagents and supplies. An incubator also was added.

In March, owing to the necessity for additional beds, Ward C was made available by the construction of a runway connecting the ward with the main building.

Due to the continuing and increasing demand for beds, and the inadequacy of the clinic accommodations in the administration building, request has been made for funds for the erection of a connecting link between Ward C and the present main building. This addition will furnish additional beds and facilities for the clinic.

Cement walks and connections were built between Ward C and the store building and between Cottages A and F on the upper street.

The new garage was provided with a cement floor.

An assembly and recreation room was finished in the basement of Ward C.

Acknowledgments.—Again it is a pleasure to acknowledge the very general cooperation and assistance of officers and employees in the administration of the hospital in all that it implies. Acknowledgment is made also of the cooperation of the Department and the generous consideration of the officers to the many Hospital problems.

The chaplains, Rev. Melville Shafer and Rev. Father Butler have given freely of their time and have been a source of much comfort to the patients.

Respectfully submitted,

LYMAN A. JONES,
Superintendent.

POPULATION.

	Males.	Females.	Totals.
Number admitted during the year	361	328	689
Number discharged during the year	335	314	649
Number remaining in hospital at end of fiscal year	46	34	80
Daily average attendance (number of inmates actually present during year)	35.37	32.30	67.67
Daily average number of officers and employees	35.45	37.34	72.79

EXPENDITURES.

Current Expenditures:			
Salaries and wages		\$80,287 86	
Clothing		794 92	
Subsistence		57,901 07	
Ordinary		8,220 15	
Office, Domestic, Outdoor Exp.		24,096 85	
			\$171,300 85
Extraordinary expenditures:			
Permanent Improvements:			
Reconditioning Cold Storage Plant		\$1,892 30	
Additional Fire Protection		7,777 38	
Relaying Water Main		1,849 51	
Care and distribution of Radium		4,001 87	
			24,754 68
Grand Total			\$196,055 53

Summary of Current Expenses.

Total Expenditures	\$196,055 53
Extraordinary expenses deducted	24,754 68
	\$171,300 85
Deducting amount of sales	741 98
	\$170,558 87

Dividing this amount by the daily number of patients, 67.67, gives a net cost for the year of \$2,520.45, equivalent to an average weekly net cost of \$48.47.

VALUATION.

Land.

Grounds, 15.7 acres	\$1,570 00
Lawns and buildings, 14.2 acres.	
Roads, 1.5 acres.	
Woodland, 292.1 acres	14,260 00
Orchard, 1.0 acres	230 00
Waste and miscellaneous, 15.4 acres	150 00
Rough pasture, 10.0 acres.	
Meadow swamp, 5.0 acres.	
Sewer beds, 0.1 acres.	
Coal trestle, 0.3 acres.	
	\$16,210 00
Sewerage System	5,250 00
Water System	10,900 00
Fire Protection	7,777 38
	\$40,137 38

Buildings.

Institution Buildings	\$200,000 00
Additions (1926 to Nov. 30, 1928)	187,975 43
Farmhouse	2,500 00
	\$430,613 81
Present value of all personal property as per inventory of November 30, 1928	70,642 40
Grand total	\$501,256 21

Statistical Tables.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Hospital December 1, 1927	20	20	40
Patients admitted December 1, 1927, to November 30, 1928, inclusive	361	328	689
Patients discharged from December 1, 1927, to November 30, 1928, inclusive	235	314	649
Patients remaining in Hospital, November 30, 1928	46	34	80
Daily average number of patients	35.37	32.30	67.67
Deaths (included in number discharged)	104	76	180

TABLE 2. — *Readmissions.*

	Males.	Females.	Totals.
Total patients treated	381	348	729
Less readmissions	95	79	174
Less patients in Hospital December 1, 1927	20	20	40
Number new patients admitted from December 1, 1927, to November 30, 1928	266	249	515
Total number different patients treated from December 1, 1927, to November 30, 1928, inclusive	286	269	555

All tables following are based on number of new patients treated.

TABLE 3. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	72	35	107
Married	141	137	278
Widowed	53	74	127
Divorced	—	2	2
Separated	—	1	1
Totals	266	249	515

TABLE 4. — *Age of Patients Admitted.*

	Males.	Females.	Totals.
Under 20 years	1	—	1
20 to 29 years	8	5	13
30 to 39 years	13	27	40
40 to 49 years	39	55	94
50 to 59 years	74	63	137
60 to 69 years	78	67	145
70 to 79 years	42	22	64
80 to 89 years	11	10	21
Totals	266	249	515

TABLE 5. — *Nativity of Patients Admitted.*

	Males.	Females.	Totals.
United States	129	141	270
Albania	1	—	1
Armenia	1	—	1
Austria	1	—	1
Canada	26	20	46
England	16	13	29
Finland	2	2	4
Germany	5	4	9
France	12	10	22
Greece	1	—	1
India	—	1	1
Ireland	38	21	59
Italy	7	8	15
Lithuania	1	1	2
Norway	2	—	2
Poland	5	6	11
Portugal	4	2	6
Russia	5	8	13
Scotland	3	5	8
Sweden	6	6	12
Switzerland	1	—	1
Syria	—	1	1
Totals	266	249	515

TABLE 6. — *Residence of Patients Admitted.*

Abington, 2	Gardner, 6	Montague, 2
Amesbury, 1	Greenfield, 3	Nahant, 1
Amherst, 1	Hardwick, 2	Nantucket, 1
Arlington, 2	Haverhill, 3	Needham, 2
Ashby, 1	Holyoke, 1	New Bedford, 9
Athol, 2	Hopedale, 1	New Salem, 1
Attleboro, 12	Hopkinton, 1	Norfolk, 1
Blackstone, 1	Hubbardston, 2	North Adams, 3
Boston, 94	Hull, 1	North Andover, 1
Braintree, 1	Lawrence, 19	North Attleborough, 11
Bridgewater, 1	Lee, 1	Northampton, 1
Brockton, 17	Leicester, 1	Northfield, 1
Brookfield, 1	Leominster, 9	Norton, 4
Brookline, 1	Lexington, 3	Norwood, 8
Cambridge, 12	Littleton, 1	Oak Bluffs, 1
Charlton, 1	Lowell, 14	Orange, 3
Chelsea, 5	Lynn, 12	Peabody, 1
Chicopee, 1	Malden, 6	Pepperell, 1
Clinton, 1	Marblehead, 1	Petersham, 1
Dedham, 7	Marlborough, 1	Plainville, 1
Dracut, 1	Maynard, 1	Plymouth, 1
Duxbury, 1	Medfield, 5	Quincy, 6
East Bridgewater, 4	Medford, 3	Rehoboth, 1
Everett, 3	Medway, 1	Revere, 4
Fall River, 20	Melrose, 1	Rockland, 1
Falmouth, 1	Methuen, 3	Royalston, 1
Fitchburg, 8	Middleborough, 2	Salem, 1
Foxborough, 8	Middlefield, 1	Saugus, 4
Framingham, 1	Milford, 5	Sharon, 2
Franklin, 7	Millis, 1	Somerville, 7
Freetown, 1	Milton, 1	Southborough, 1

TABLE 6. — *Residence of Patients Admitted* — Concluded.

Southbridge, 3	Uxbridge, 3	West Springfield, 2
Springfield, 5	Wakefield, 1	Westborough, 1
Stoughton, 2	Walpole, 6	Westminster, 1
Sturbridge, 2	Waltham, 3	Westwood, 1
Swampscott, 1	Ware, 1	Whitman, 1
Swansea, 1	Wareham, 1	Williamstown, 1
Taunton, 12	Watertown, 3	Winchester, 1
Templeton, 1	Wayland, 1	Winthrop, 1
Tewksbury, 9	Webster, 2	Woburn, 3
Tyringham, 1	West Bridgewater, 1	Worcester, 18
Upton, 2	West Newbury, 1	Wrentham, 8

TABLE 7. — *Occupation of Patients Admitted.*

	Males.	Fe- males.	Totals.		Males.	Fe- males.	Totals.
Assistant undertaker	1	—	1	Lighthouse keeper	1	—	1
Baker	1	—	1	Lineman	1	—	1
Barber	5	—	5	Longshoreman	1	—	1
Bill poster	1	—	1	Machine operator	—	3	3
Blacksmith	3	—	3	Machinist	7	—	7
Bookkeeper	—	1	1	Manager	1	—	1
Braider	—	1	1	Manager tea room	—	1	1
Brakeman	2	—	2	Market man	1	—	1
Bleachery employee	1	—	1	Mason	3	—	3
Bricklayer	2	—	2	Meat cutter	1	—	1
Butler	1	—	1	Meat dealer	1	—	1
Cabinet worker	2	—	2	Mechanic	5	—	5
Card worker	1	—	1	Merchant	1	—	1
Caretaker	1	—	1	Mill hand	5	—	5
Carpenter	6	—	6	Milliner	—	1	1
Chambermaid	—	1	1	Mill worker	4	—	4
Chauffeur	1	—	1	Motorman	1	—	1
Cleaning woman	—	1	1	Moulder	2	—	2
Clerk	4	—	4	Napper (wool)	1	—	1
Combmaker	1	—	1	No occupation	2	14	16
Conductor	1	—	1	Nurse	—	2	2
Cook	4	2	6	Orderly	1	—	1
Contractor	2	—	2	Paper hanger	1	—	1
Counterman	1	—	1	Painter	12	—	12
Cutter	1	—	1	Photographer	1	—	1
Designer	1	—	1	Plumber	1	—	1
Doctor	2	—	2	Pressman	2	—	2
Domestic	—	4	4	Practical nurse	—	2	2
Dressmaker	—	2	2	Printer	1	—	1
Elevator man	1	—	1	Publicity solicitor	1	—	1
Engineer	6	—	6	Retired	1	—	1
Errand boy	1	—	1	Rubber worker	—	1	1
Expressman	1	—	1	Roofer	1	—	1
Factory worker	1	—	1	Saleslady	—	2	2
Farmer	8	—	8	Salesman	6	—	6
Farm hand	1	—	1	Seaman	1	—	1
Fireman	4	—	4	Seamstress	—	2	2
Foreman	4	—	4	Shipper	2	—	2
Fruit dealer	1	—	1	Shoe worker	5	4	9
Furniture finisher	1	—	1	Sign writer	1	—	1
Gardener	2	—	2	Spinner	1	1	2
Gate tender	2	—	2	Steam fitter	1	—	1
Glass polisher	1	—	1	Steel worker	1	—	1
Grocer	1	—	1	Steeple jack	1	—	1
Horse trainer	1	—	1	Stone worker	2	—	2
Hosiery mender	—	1	1	Student	2	—	2
Hotel clerk	1	—	1	Teacher	—	1	1
Hotel worker	—	1	1	Tailor	3	—	3
Housekeeper	—	19	19	Teamster	4	—	4
Houseman	1	—	1	Telephone installer	1	—	1
Housewife	—	151	151	Tire worker	1	—	1
Housework	—	16	16	Tomb maker	1	—	1
Iceman	1	—	1	Unknown	1	—	1
Inmate	—	4	4	Waiter	1	3	4
Inspector	2	2	4	Washerwoman	—	1	1
Iron Foundryman	1	—	1	Watchmaker	6	—	6
Iron worker	2	—	2	Watchman	6	—	6
Janitor	5	—	5	Weaver	6	—	6
Jeweler	3	—	3	Winder	—	1	1
Jewelry worker	—	1	1	Woodworker	2	—	2
Kitchen helper	1	—	1	Wool sorter	2	—	2
Laborer	52	—	52	Yarn hand	2	—	2
Laundress	—	3	3				
Leatherworker	2	—	2	Totals	266	249	515

TABLE 8. — *Stage of Disease of Patients Admitted.*

	Males.	Females.	Totals.
Early	18	15	33
Moderately Advanced	27	30	57
Advanced	200	164	364
Not Cancer	21	39	60
No Diagnosis	—	1	1
Totals	266	249	515

TABLE 9. — *Condition of Patients Discharged.*

	Males.	Females.	Totals.
Relieved	17	10	27
Improved	104	133	237
Same	58	52	110
Unimproved	46	49	95
Died (Autopsies 83)	104	76	180
Totals	329	320	649

This table includes all cases treated at the Hospital since its opening, June 21, 1927, whether as in or out patients. In a few instances the same patient has been counted twice or more times, according to the varying conditions presented.

	Males.	Females.	Totals.
CARCINOMA.			
Breast	—	83	83
Totals	—	83	83
Buccal Cavity:			
Buccal Mucosa	31	4	35
Alveolar Process	1	—	1
Jaw, lower	6	1	7
Lip	30	2	32
Palate	3	1	4
Tongue, floor of mouth	42	1	43
Tonsil	7	—	7
Totals	120	9	129
Female Genital Organs:			
Cervix	—	81	81
Ovary	—	9	9
Uterus	—	16	16
Vagina	—	1	1
Vulva	—	11	11
Totals	—	118	118
Male Genital Organs:			
Penis	4	—	4
Prostate	10	—	10
Testicles	1	—	1
Totals	15	—	15
Peritoneum, Intestines, Rectum, etc.:			
Anus	2	—	2
Colon, transverse	—	1	1
Rectum	19	13	32
Sigmoid	4	6	10
Totals	25	20	45
Skin:			
Axilla	1	—	1
Of Body	2	1	3
Of Extremities	4	1	5
Cheek	10	4	14
Ear	16	—	16
Eyebrow	—	1	1
Eyelid	2	2	4
Face	13	5	18
Forehead	1	1	2
Mastoid Region	5	1	6
Neck	1	—	1
Nose	9	3	12
Orbit	2	—	2
Parotid Region	5	1	6
Scalp	—	1	1
Temple	2	2	4
Totals	73	23	96
Stomach, Liver, etc.:			
Abdominal Carcinomatosis	1	1	2
Epiglottis	1	—	1
Esophagus	7	1	8
Gall Bladder	—	1	1
Hypopharynx	3	—	3

CARCINOMA.		Males.	Females.	Totals.
Stomach, Liver, etc. — <i>Concluded.</i>				
Intestines		5	5	10
Liver		3	—	3
Nasopharynx		1	—	1
Pancreas		3	1	4
Pharynx		4	—	4
Pyliform Fossa		3	—	3
Stomach		27	11	38
Totals		58	20	78
Urinary Organs:				
Bladder		7	3	10
Totals		7	3	10
Other Sites:				
Antrum		—	1	1
Brachial		1	—	1
Larynx		14	1	15
Lung		2	1	3
Mediastinum		—	1	1
Nose		8	1	9
Thyroid		1	1	1
Tumor of Ethmoid		1	—	1
Totals		26	6	32
SARCOMA.				
Antrum		1	—	1
Angiosarcoma		1	—	1
Fibrosarcoma:				
Arm		1	—	1
Breast		—	1	1
Leg		1	—	1
Leiomyosarcoma Uterus		—	1	1
Melanotic Sarcoma		1	2	3
Neck		1	—	1
Orbit		—	1	1
Osteogenic Sarcoma		1	1	2
Retroperitoneal Sarcoma		1	—	1
Sarcomatosis		1	—	1
Testical		1	—	1
Totals		10	6	16
MISCELLANEOUS.				
Central Nervous System		—	1	1
Cordoblastoma		—	1	1
Cerebral Tumor		1	—	1
Endothelioma		1	—	1
Glioma		—	1	1
Lymphosarcoma		—	1	1
Lymphoblastoma		7	3	10
Totals		9	7	16
NON-MALIGNANT TUMORS.				
Accessory Breast		—	1	1
Adamantinoma		1	—	1
Adenoma:				
Breast		—	2	2
Thyroid		—	3	3
Thyroid, intrathoracic		—	1	1
Adenofibroma:				
Breast		—	1	1
Angioma:				
Spider		1	—	1
Telangiectotic		1	—	1
Cyst, Buttock		—	1	1
Cyst, Breast		—	1	1
Cyst, Mucous, lip		1	1	2
Cyst, Sebaceous		1	4	5
Fibroma:				
Abdominal Wall		1	—	1
Arm		1	—	1
Breast		—	1	1
Ear		—	1	1
Knee		—	1	1
Skin of face, congenital		1	—	1
Thigh		—	1	1
Uterus		—	1	1
Fibroid, Uterus		—	6	6
Hemangioma		2	3	5
Keloid		2	—	2
Lipoma:				
Arm		1	—	1
Loin		—	1	1
Neck		1	1	2
Popliteal Space		—	1	1
Sternum		—	1	1

NON-MALIGNANT TUMORS.										Males.	Females.	Totals.
Melanoma	.	.	.	.	.	.	.	.	.	—	1	1
Mole	.	.	.	.	.	.	.	.	.	1	2	3
Mole, pigmented	.	.	.	.	.	.	.	.	.	1	—	1
Noevus	.	.	.	.	.	.	.	.	.	—	8	8
Papilloma:												
Arms	.	.	.	.	.	.	.	.	.	1	—	1
Eyelid	.	.	.	.	.	.	.	.	.	1	—	1
Face	.	.	.	.	.	.	.	.	.	1	2	3
Finger	.	.	.	.	.	.	.	.	.	1	1	2
Lip	.	.	.	.	.	.	.	.	.	—	1	1
Nose	.	.	.	.	.	.	.	.	.	1	—	1
Skin	.	.	.	.	.	.	.	.	.	1	—	1
Polyp:												
Cervix	.	.	.	.	.	.	.	.	.	—	4	4
Verruca Vulgaris:												
Finger	.	.	.	.	.	.	.	.	.	—	5	5
Hand	.	.	.	.	.	.	.	.	.	4	3	7
Totals	.	.	.	.	.	.	.	.	.	26	60	86
SPECIAL SKIN DISEASES.												
Comedo	.	.	.	.	.	.	.	.	.	—	1	1
Dermatitis Venenata	.	.	.	.	.	.	.	.	.	—	1	1
Keratosis	.	.	.	.	.	.	.	.	.	28	15	43
Lupus	.	.	.	.	.	.	.	.	.	1	1	2
Papillary Mole	.	.	.	.	.	.	.	.	.	—	1	1
Psoriasis	.	.	.	.	.	.	.	.	.	1	2	3
Scabies	.	.	.	.	.	.	.	.	.	1	—	1
Ulcer	.	.	.	.	.	.	.	.	.	1	—	1
Totals	.	.	.	.	.	.	.	.	.	32	21	53
OTHER CONDITIONS.												
No Disease	.	.	.	.	.	.	.	.	.	14	22	46
No Diagnosis	.	.	.	.	.	.	.	.	.	8	17	25
Not Cancer	.	.	.	.	.	.	.	.	.	69	117	186
Totals	.	.	.	.	.	.	.	.	.	91	156	247

REPORT OF THE CANCER SECTION.

During 1928, the Cancer Section has continued its four-fold activities of hospital admissions, clinic supervision, educational work, and statistical research.

PONDVILLE ADMISSIONS.

The following table shows the disposition of all applications to the Pondville Hospital from January 1, 1928, to December 31, 1928:

TABLE I. — *Disposition of All Applications to Pondville.*

	Males.	Females.	Totals.
Number of Applications	400	369	769
Number of Admissions	366	338	704
Number not Admitted	34	31	65
Number Discharged	234	252	486
Number Died	112	76	188
Ratio of Deaths to Admissions	30.6	22.4	26.7

The next table shows the disposition of the patients not admitted to the Pondville Hospital:

TABLE II. — *Reasons for not being Admitted.*

Not Eligible	3
Died Before Admission	10
Did Not Wish to Go	18
Went to Other Hospitals	12
Too Ill to Travel	11
Miscellaneous	4
Pending	7
Total	65

Table III shows the average population per day at the Pondville Hospital, by months:

TABLE III. — *Average Population per Day at Pondville.*

January, 1928	60.8
February	55.5
March	63.4
April	70.7
May	71.0
June	64.3
July	71.3
August	75.1
September	76.5
October	82.0
November	80.0
December	80.0

Daily Average for the Year 70.8

The average length of stay in the hospital for individuals who have been discharged has been as follows:

TABLE IV. — *Average Duration of Stay in Hospital.*

	Males.	Females.	Totals.	Average.
Died on First Admission	44.0	66.9	54.2	60.9
Died on Subsequent Admission	75.8	57.0	69.7	
Discharged Alive First Admission	27.2	22.2	24.4	21.1
Discharged Alive Subsequent Admission	14.4	20.7	17.5	
Average Length of Stay of All Cases				32.1

STATE-AIDED CANCER CLINICS.

Cancer clinics have been established in eleven communities during the year. This brings the total number of administrative units to twelve and the number of cities and towns having cancer clinics to seventeen. They are: Boston, Fitch-

burg, Gardner, Great Barrington, Greenfield, Lawrence, Leominster, Lowell, Lynn, Montague, New Bedford, Newton, Norfolk, North Adams, Pittsfield, Springfield, and Worcester.

During 1928 patients came to the State-aided cancer clinics from 199 cities and towns of Massachusetts. Twenty-six patients came from other New England states and one person from outside New England. The towns from which two or more patients per 1,000 inhabitants went to the cancer clinics are listed in Table V.

TABLE V. — *Residents of Massachusetts Cities and Towns Attending State-Aided Cancer Clinics.*

[Rate per 1,000. 1925 Census.]

Wrentham	9.4	Dunstable	3.0
Foxborough	7.3	Norton	2.9
Tolland	6.7	Lynn	2.8
Norfolk	6.6	Orleans	2.8
Tyngsborough	5.4	Hubbardston	2.8
Templeton	5.3	Leominster	2.6
Walpole	4.9	Becket	2.6
Ashfield	4.4	Westford	2.5
Winchendon	4.2	Greenfield	2.4
Westminster	4.2	Fitchburg	2.4
Medfield	3.9	East Brookfield	2.2
New Salem	3.9	Greenwich	2.2
Franklin	3.7	Ashby	2.2
Royalston	3.7	Fairhaven	2.2
Nahant	3.7	Great Barrington	2.2
Gardner	3.6	Bellingham	2.1
Lowell	3.5	Lunenburg	2.1
Rowe	3.4	Longmeadow	2.1
Tewksbury	3.4	Lenox	2.1
Saugus	3.4	Deerfield	2.0
Heath	3.4	Dover	2.0
Shelburne	3.3	Dracut	2.0
Chelmsford	3.0	Carlisle	2.0

38 towns had a rate between 1 and 2 per 1,000.

115 towns had a rate below 1 per 1,000.

156 towns were not represented at the clinics.

TABLE VI. — *Cancer Clinic Information.*

	MALES.		FEMALES.		TOTALS.	
	1927.	1928.	1927.	1928.	1927.	1928.
Attendance	418	852	931	1,690	1,349	2,542
Cancer Cases	146	348	173	380	319	728
Operable Cancer Cases with Chance for Cure	91	166	108	178	199	344
Per Cent with Cancer	34.9	40.8	18.6	22.4	23.6	28.6
Per Cent of Total Cancers which were Operable with Chance for Cure	62.3	47.8	62.4	46.8	62.4	47.2
Median Age of Cancer Patients	62.3	62.4	58.2	54.4	60.2	59.1
Median Age of Non-Cancer Patients	47.2	47.7	45.4	44.1	46.0	44.9

TABLE VII. — *Attendance at State-Aided Cancer Clinics, 1928.*

CLINIC.	Total Attendance.	Total Cancer Cases.	Per Cent of Total Cancer Cases.	Operable Cancer Cases, Chance for Cure.	Per Cent of Total Cancers which were Operable with Chance for Cure.
Springfield	140	34	24.2	15	44.0
Worcester	181	50	28.2	34	68.0
Greenfield	76	15	19.7	4	27.0
Berkshire	90	26	28.8	14	54.0
Worcester North	306	62	20.2	20	32.0
Lowell	456	67	14.7	18	27.0
Lynn	378	121	32.0	55	45.0
Lawrence	69	20	29.0	11	55.0
Newton	14	3	21.4	3	100.0
New Bedford	280	63	22.5	34	53.0
Pondville	479	217	45.3	114	52.0
Boston Dispensary	73	50	68.5	21	42.0
All Clinics	2,542	728	28.6	343	47.0

TABLE VIII. — *Duration of Symptoms, by Months.*

	MALES.		FEMALES.		TOTALS.	
	1927.	1928.	1927.	1928.	1927.	1928.
Median Interval between First Symptoms and First Visit to Physician	7.1	7.8	3.0	5.1	6.0	6.6
Median Interval between First Symptoms and First Visit to Clinic	12.8	14.5	11.8	11.8	12.3	12.5
Per Cent of Cancer Cases Coming to Clinic with duration of Disease under three months	33.8	38.1	51.4	43.8	43.4	41.1
Per Cent of Cancer Cases Coming to Clinic with duration of Disease over two years	18.4	27.4	23.3	23.6	21.1	25.4

TABLE IX. — *Reasons for Coming to Clinic (All Clinics).¹*

	ALL CLINIC PATIENTS.		CANCER PATIENTS.		OPERABLE CANCER CASES WITH CHANCE FOR CURE.	
	1927.	1928.	1927.	1928.	1927.	1928.
Newspapers	64.7	45.2	40.4	33.4	44.2	31.1
Physicians	20.0	28.8	45.7	48.1	45.7	49.7
Friends or Relatives	9.1	15.1	6.9	10.2	6.0	11.3
Nurses	3.6	3.5	3.8	2.6	3.0	2.0
Social Workers . . . . .	.8	1.8	.9	2.6	.5	2.6
All Others	4.0	8.6	4.2	6.5	2.0	5.7

¹ Does not total to 100 per cent as some individuals gave more than one reason.TABLE X. — *Reasons for Coming to Clinic, by Individual Clinic, 1928.¹*

NAME OF CLINIC.	Newspapers.	Doctors.	Friends and Relatives.	Others.
Berkshire	64.5	23.3	20.0	10.0
Boston Dispensary	30.1	24.6	15.1	30.1
Franklin County	56.6	25.0	3.9	15.3
Lawrence	72.5	11.6	2.9	18.8
Lowell	43.6	12.8	28.1	15.5
Lynn	61.5	18.2	11.4	11.6
New Bedford	56.8	21.1	12.1	12.5
Newton	35.7	35.7	7.1	21.4
Pondville	12.1	65.9	15.1	9.2
Springfield	46.4	11.4	17.1	26.4
Worcester	42.5	41.9	1.1	16.0
Worcester North	57.8	21.9	13.1	10.4
Totals	45.2	28.8	15.1	13.9

¹ Does not total to 100 per cent as some individuals gave more than one reason.

TABLE XI. — *Contact of Cancer Patient with Physician.*

	NO PHYSICIAN.		ONE PHYSICIAN.		MORE THAN ONE PHYSICIAN.		UNKNOWN.		PER CENT OF NO PHYSICIAN.	
	1927.	1928.	1927.	1928.	1927.	1928.	1927.	1928.	1927.	1928.
Contact of Cancer Patient with Physician before Coming to Clinic	57	167	134	322	102	210	26	29	17.9	22.9

TABLE XII. — *Location of Cancer.*

	MALES.		FEMALES.		TOTALS.	
	1927.	1928.	1927.	1928.	1927.	1928.
Buccal and Oesophagus	43.8	39.9	6.9	5.5	23.8	21.9
Stomach	4.1	3.4	2.9	.8	3.4	2.0
Liver	.0	.3	.6	.3	.3	.3
Other Digestive Tract	6.2	3.1	2.3	2.1	4.1	2.6
Uterus	.0	.0	14.9	17.1	8.2	8.9
Skin	37.0	43.7	23.7	29.2	29.8	36.1
Breast	2.0	.9	37.0	29.2	21.0	15.7
All Others, including Unknowns	6.9	8.6	11.6	15.8	9.4	12.4

TABLE XIII. — *Symptoms which Brought Patient to Clinic, 1928.*¹

SYMPTOMS.	Non-Cancer.	Operable Cancer, Chance for Cure.	All Other Cancers.	Total.
Swelling	35.4	38.3	32.0	35.2
Ulceration	6.9	38.0	19.8	13.0
Discharge	11.9	10.8	15.4	12.6
Pain	50.7	15.4	28.9	42.5
Deformity	.9	2.9	1.6	1.3
Loss of Weight	10.6	4.9	9.9	10.4
Malaise	9.5	4.6	4.9	8.1
Bleeding	6.0	9.3	7.0	6.6
Itching	5.2	6.4	3.9	5.1
Scaly Skin	2.7	11.0	8.8	4.7
Others and Unknown	3.4	1.5	5.7	3.5

¹ Does not total to 100 per cent as some individuals gave more than one symptom.

A comparison has been made between the nativity groups attending the clinics and the percentage of deaths in the State from these same groups in 1928:

TABLE XIV. — *Cancer by Nativity Groups.*

	Per Cent of Cancers in Clinics.	Per Cent of Deaths in State.	Per Cent of Non-Cancer in Clinics.
Native Born of Native Parents	35.5	29.1	30.8
Native Born of Foreign Parents	21.7	20.1	23.1
Foreign Born	42.8	45.9	46.1
Unknown Parentage	—	4.9	—

A comparison of the cancer patients at the clinics and the cancer deaths by nativity groups is a measure of the effectiveness of the cancer program in reaching the individual nationalities.

The following table shows that further educational work is needed with some of these groups:

TABLE XV. — *Cancer Among Foreign-born.*

COUNTRY.	Per Cent of Cancer Cases Among Foreign-born.	Per Cent of Cancer Deaths Among Foreign-born.
Ireland	21.8	26.7
England, Scotland, Wales	16.1	13.8
Canada	30.2	30.9
Russia-Poland	7.4	7.5
Spain, Greece, Portugal, France	7.1	3.9
Norway, Denmark, Sweden	3.9	5.1
Italy	3.9	4.4

Of all patients found to have cancer 35.7 per cent were advised to go to Pondville; 20 per cent were referred to the local hospital; and the remaining 41.3 per cent were given other advice. Operations were advised for 33.5 per cent of the cancer patients; radium for 32.3 per cent; and electro-surgery for 6.3 per cent. The remainder were either given no advice, or a combination of treatments was advised.

EDUCATION.

The educational activities of the preceding year have been continued, and in addition, an intensive cancer campaign was conducted during the third week of April, 1928. It has been estimated that, as a result of this campaign, 12,000 persons consulted physicians to determine whether or not they had cancer.

Twelve radio talks have been broadcasted.

We have 7,852 inches of newspaper space in our files, but this probably represents only a fractional part of the total volume.

Approximately 117,000 pamphlets and reprints have been distributed during the year.

One hundred and two groups have been addressed with a total attendance of over 6,000 persons.

CONFERENCES.

Two conferences were held at the Pondville Hospital; one for the medical group, and the other for the educational and social workers. The attendance was thirty-five and eighty, respectively.

STUDIES.

The studies in which the Department has been interested during the past year have been as follows:

1. *Study of the Death Records.* — The relationship between the various types of cancer and the nativity of the individual were studied. Death records have been obtained from Ireland and Italy to compare with those of the Irish and Italians of this country.

2. *The Nurses' Questionnaire.* — This questionnaire has been continued with modifications.

3. *The Boston Dispensary Study.* — This study is being continued.

4. *The Massachusetts General Hospital Study.* — This study is also being continued.

5. *The Lawrence Survey.* — A house-to-house sickness survey was made in the city of Lawrence. Records were obtained for 28,000 individuals. This work has not yet been tabulated.

6. *The Cambridge Survey.* — A morbidity-sociological survey has been started among a selected group.

7. *The Lee Survey.* — A house-to-house canvass of the town of Lee was made to determine the etiological factors of septic sore throat.

8. *The Wayland Survey.* — A house-to-house canvass of the town of Wayland was conducted to determine the morbidity in the town and whether or not need for a hospital existed.

MASSACHUSETTS STATISTICS FOR 1928.

Estimated population	4,324,873
Death rate per 1,000 population	11.9
Infant mortality (per 1,000 live births)	64.7

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FIFTEENTH ANNUAL REPORT

OF THE

DEPARTMENT OF PUBLIC HEALTH OF MASSACHUSETTS

REPORT OF THE PUBLIC HEALTH COUNCIL.

At the end of the fiscal year closing November 30, 1929, the Department of Public Health was constituted as follows:

Commissioner of Public Health GEORGE H. BIGELOW, M.D.

PUBLIC HEALTH COUNCIL.

GORDON HUTCHINS, 1931.

SYLVESTER E. RYAN, M.D., 1931.

FRANCIS H. LALLY, M.D., 1930.

RICHARD P. STRONG, M.D., 1932.

ROGER I. LEE, M.D., 1930.

JAMES L. TIGHE, B.A.Sc., C.E., 1932.

During the year sixteen formal meetings of the Department were held as well as meetings of the standing committees.

The Committee on Sanitary Engineering composed of Mr. Tighe, Chairman, Mr. Hutchins and Dr. Bigelow, has continued the practice of meeting prior to the regular monthly meeting of the Council and submitting its recommendations on all matters of sanitary significance that may come before the Department.

In the spring the Council held a meeting at the Pondville Hospital. After the regular matters were handled the institution was inspected with a demonstration of the new fire protection system, ward rounds were made, equipment was demonstrated and further needs were discussed. This completes the formal rounds by the Council of the five institutions administered by the Department. Also the Council inspected the sewer outlets in Boston Harbor in connection with the Legislative study of the pollution of the Harbor in which the Department is taking part; it visited the Ware River watershed; it held hearings on plans for the protection of public water supplies and other matters as required by statute; it approved appointments submitted by the Commissioner; and it considered, advised and promulgated policies on the wide variety of matters with which the Department is concerned.

Chapter 43 of the Resolves of 1929 directed the Department to investigate the "need, as a health measure, for establishing a board of registration of barbers or otherwise regulating the practice of barbering." This study has been made and a report submitted.

Chapters 16 and 48 of the Resolves of 1929 designated the Commissioner as a member of special commissions to study such changes in the plumbing laws of the State as might be indicated, and to study further the problem of the filling of certain portions of Fort Point Channel and South Bay, respectively. These two commissions have made their studies and submitted reports.

Also, as has already been mentioned, the Department is designated by chapter 49 of the Resolves of 1929 to co-operate in a two years' study of the pollution of Boston Harbor. This study is under way.

At a meeting of the Department on January 14, 1930 the Commissioner of Public Health presented to the Council a report of the activities of the Department for the year 1929, and it was voted that this report, together with the foregoing brief summary of the doings of the Public Health Council, be approved and adopted as the report of the Department of Public Health for the year 1929.

FIFTEENTH ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC HEALTH.

To the Public Health Council:

GENTLEMEN: — I have the honor to submit herewith my annual report for the fiscal year ending November 30, 1929, although for ease of comparison figures will be given for the calendar year.

There are certain matters of especial importance to which attention should be called: With the support of His Excellency, the Governor, legislation allowing towns to combine in union health districts was passed and offers an economical solution for the small community of adequate modern health service through the full time health officer, public health nurse and milk and other food inspectors, which other parts of the country are obtaining through the county organization; through the creation of a Division of Adult Hygiene the vista of the Department has been almost indefinitely widened and no one has the temerity to say where the end will be; more towns have adopted milk regulations this year than in the previous twenty, but still raw milk has sickened in 1929 in Massachusetts with scarlet fever and again with septic sore throat, and has infected with bovine tuberculosis one third of the children who come to the Lakeville State Sanatorium; nearly 5,000 cases of dog bite have been reported to us and two human deaths from rabies due entirely to the widespread blight of indifference; over 200 cases of smallpox occurred in persons only one per cent of whom had ever been vaccinated, all in a town where except for indifference to law such a situation should have been impossible; a graduate course in cancer was attended by over 400 doctors and dentists; our minimum standards for quarantine and for health and sanitation of summer camps seem slowly, and we hope, surely having an effect; following hospital outbreaks of typhoid fever and diphtheria only fifteen of the 153 general hospitals questioned were interested enough to inform us of their practice in regard to immunizing their nurses against these diseases; the drought has clearly demonstrated the low margin of safety possessed by our small municipal water supplies. These and other points will be elaborated in this report and in those of the Division Directors which follow.

I. COMMUNICABLE DISEASES.

Again there is a fluctuation in the total communicable diseases reported. The total cases this year were 86,192 or 16 per cent less than last year which showed 23 per cent more than 1927. As these fluctuations were due largely to measles they are matters with which in our present knowledge we are quite helpless to cope. But were knowledge of an active immunizing agent given to us, as in diphtheria and smallpox, indifference and active opposition would probably perpetuate the futility. Other decreases were noted in anterior poliomyelitis (infantile paralysis), mumps and tuberculosis, while there was an increased prevalence of diphtheria, dog bite, epidemic meningitis, German measles, chicken pox, influenza, pneumonia and smallpox.

Communicable Disease Practice.—Now that permissive legislation has been passed under which two or more towns can combine in union health districts for a full time health staff, as they have been doing for years for full time superintendents of schools, we must interest suitable groups to avail themselves of it. Such a full time trained staff means not only service in the control of communicable disease and for the preschool and school child, but also more adequate milk and other food inspection. The present prevalent use of part time service means either incompetence, or exploitation at what is usually paid for such service. Dr. Ray Lyman Wilbur, Secretary of the Interior, pointed out that New England lagged behind other parts of the country in giving the rural dwellers the advantage of full time health service through county organizations. In Barnstable County fifteen towns are now profiting by such service. For most of the rest of the State the small towns must form union health districts rather than county units (because of the size of our counties) and remove this stigma from us.

This need is illustrated in another way. Massachusetts alone among the States has no uniform quarantine regulations. That puts a peculiar responsibility on the local health authorities which they are far from meeting. To avoid confusion and conflict we drew up with the approval of the Massachusetts Association of Boards of Health minimum quarantine requirements. After Herculean efforts by our district health officers over some three years, 80 cities and towns have adopted them while fifteen more say they are using them although their legal adoption has been delayed because of the cost of publication as the law requires. That

leaves 260 communities in the State without any vestige of regulation or, in a few instances, regulations which conflict with the standard. Then these same towns are indignant that we cannot get them out of their difficulty when serious communicable disease appears and the public is aroused.

Further, about 100 cities and towns now require at least that all milk sold shall be either from non-tuberculous cattle or pasteurized. While this is a great improvement over a few years ago, it still leaves 255 communities in which anything that is white, pours and comes from a cow may be sold. Further, over a million people daily consume milk in towns where there is no suggestion of milk inspection. For the most part in such towns the milk is all raw. Those commercially interested in milk should realize the menace to their interests that such a state of affairs means. Through grouping for full time service in union health districts will be found the answer to these and other vexing matters.

Outbreaks. — Twenty-two "outbreaks" of communicable disease were recognized by the Department. These outbreaks accounted for 790 cases and 19 deaths, and were distributed as follows: Gastrointestinal, 11, in three of which the dysentery bacillus was found; typhoid, five; scarlet fever, two; and one each of smallpox, septic sore throat, diphtheria and whooping cough. One can but conjecture as to the number of outbreaks that never reached the level of our consciousness.

Diphtheria. — Following the sharp decline in the incidence of diphtheria in 1924-26, when the rate decreased from 220 to 80 per 100,000 we anticipated an increase in the disease. But instead the rate has tended to stabilize between 90 and 100. This year the rate was 97.1 (4,255 total cases and 256 deaths). However, with the opening of the new school year the prevalence increased over last year and suggested what has been often proven, that diphtheria compensates for a period of relative infrequency by a definite increase. We can thwart this only by an increasing use of toxin-antitoxin among our younger children.

The figures for 1929 are not yet available, but for 1928 109 communities report about 67,000 inoculated. As it is estimated that about 100,000 children enter our schools each year, we must do much better than that if we are ever to build up an immune population and conquer the disease.

The outstanding piece of work in diphtheria immunization was done this year in Lowell where 11,376 children were inoculated. The particularly excellent feature was that 15 per cent were between six months and one year of age, and 45 per cent were between one and six years. Since it is the infant and preschool child most frequently killed by diphtheria, the value of this service is apparent. Several communities, notably Salem, New Bedford and Newburyport, have had high diphtheria incidence, and yet of these Newburyport is the only one this year that has made any real effort toward prevention by the use of toxin-antitoxin. Also this fall in Uxbridge and Northbridge there has been an outbreak with seven deaths largely localized in a private school which two years ago rejected efforts to help it put on an immunization program. And so it goes! We know how, and we do not prevent.

Typhoid Fever. — With 42 deaths we have a rate of 1.0 deaths per 100,000 of the population. Last year we boasted a rate of 0.83. Of course with such small figures fluctuation must be expected. But it emphasizes the fact that to hold or improve our present favorable rates will require constant vigil not only of such environmental factors as water supply, milk production and pasteurization plants, shellfish and industrial cross connections, but also for the detection and treatment of typhoid carriers and the elimination of contact cases. This year one typhoid carrier had her gall bladder removed and to date cultures have been negative. This makes the ninth carrier operated on, four at State expense, and all have given consistently negative cultures. Surely it is more effective to cure them in this way and allow them to return safely to food handling than to have us constantly rediscovering them in connection with fresh outbreaks of typhoid fever.

It is discouraging to find that of the 307 cases reported this year, 43 were secondary to another case in the family. With all the information as to the method of transmission of typhoid fever known, at least to every physician and health authority, this is an unnecessarily high number of secondary cases, which should

have been protected against the disease. There are two possible steps, (1) hospitalization of all cases, or (2) adequate nursing in the home with inoculation of all members of the family. Our records show that of 307 reported cases, 178 were hospitalized, 103 were at home and of the rest we do not yet know. But the edge of our enthusiasm for hospitalization is a bit blunted by a typhoid outbreak in a general hospital. We are still further shocked by receiving replies from only fifteen out of 153 hospitals in regard to their policy of immunizing their nurses against typhoid fever, diphtheria and smallpox. Harassed as superintendents of nurses are, what kind of a conscience have they if they allow exposure of nurses under their care without insisting on their immunization? It gives one some enthusiasm for the licensing of hospitals! In regard to care in the home, trained nursing cannot perhaps always be obtained but typhoid vaccine without cost can. Attending physicians must be more scrupulous in insisting on its use in such families and thus help to wipe out half of our typhoid fever.

Smallpox.—Two hundred and seventy-three cases! The largest number in twenty-six years, while the rest of the country is also breaking its smallpox record. The people are not aroused because it is a mild strain and yet as Detroit found some two years ago, one can never tell when a strain that kills twenty per cent may appear.

Middleborough had 223 cases of which only two had ever been successfully vaccinated and those over thirty years ago. In Middleborough the public school vaccination law had been a dead letter for no one seems to know how long. Twenty-two cases developed in adjoining communities showing that smallpox is more than a local matter, as is all communicable disease. Fourteen more cases were connected with the Gardner outbreak of December, 1928. The rest were scattered.

Let it be emphasized that of the 273 cases, 264 had never been vaccinated. Think of it! The other nine had been so vaccinated from fifteen to forty years ago. This year we are asking for legislation which will put the responsibility for a vaccinated community in the board of health where it belongs.

Epidemic Cerebrospinal Meningitis.—Last spring epidemic meningitis appeared alarmingly in California. Since then it has broken out here and there in the central and eastern parts of the country. Although we have had the largest number of cases reported since 1920 (167 cases) nothing alarming has yet occurred. In anticipation of possible epidemic proportions we are appointing an Advisory Meningitis Committee with whom we hope to work out a diagnostic service somewhat similar to that which has worked so effectively with the Harvard Infantile Paralysis Commission. It is reassuring to know from California that our serum was effective against the type of the disease there prevalent.

Anterior Poliomyelitis (Infantile Paralysis).—This year there were 119 cases reported as compared with 434 last year, and 1,189 in 1927. The cases were largely scattered over the State. The Harvard Infantile Paralysis Commission co-operating with the Department made 46 consultations of which 22 were found to be poliomyelitis. Certainly, Massachusetts is fortunate to have this excellent co-operative arrangement since independently it would be almost impossible for the Department to give such a quality of service irrespective of the cost.

Tuberculosis.—Still the waiting list for our four State Sanatoria keeps around one hundred and is most disturbing. The new children's building at Lakeville soon to open will relieve the cases of non-pulmonary tuberculosis in children. The new admission and isolation building at North Reading will fill a long felt want for infants and young children. Rutland must wait for relief on the County Commissioners of Middlesex and Worcester which means at least another year.

However through the addition of social workers to our staff we are now admitting on the basis of the medical and social conditions rather than purely chronologically as heretofore. Each case is visited and two facts are noted, (1) whether it can be benefited by a stay at our sanatorium, and (2) whether there is any other place where adequate care can be obtained. Admission is determined by these findings. Also if surroundings are found to be unfavorable for the patient to return to when he later leaves our sanatorium, contacts are made with the appropriate community agency to the end that the patient may be given the

necessary guidance and help in readjusting himself to his environment and the number of persons seeking readmission to our sanatoria may be reduced. Such service should greatly increase the effectiveness of our institutions.

The Department with an Advisory Committee composed of Dr. Cleaveland Floyd, Professor Murray P. Horwood, Mr. Frank Kiernan and Dr. Olin S. Pettingill has promulgated minimum standards for municipal tuberculosis hospitals. After a reasonable time to allow for any changes that may be indicated we contemplate disapproving those that do not comply with our standards for care of patients on whom the State pays subsidy.

During the hospital year the four State Sanatoria served 2,046 patients of whom 346 were non-pulmonary (at Lakeville), 985 were children (at North Reading and Westfield), and 697 were adults (at Rutland).

Lakeville will soon open its new children's building with 73 beds. In it will be a room for artificial heliotherapy capable of handling all the patients in the institution. This with the natural heliotherapy and surgery will allow us to give the most complete modern treatment to all the patients that come to us. It is of great interest that a third of the children at Lakeville are shown in our laboratory to have been infected with the bovine type of tuberculosis, which means through milk. This is a higher figure than formerly. Also although two employees living out of the institution came down with smallpox as part of the Middleborough outbreak, no cases occurred among the resident staff or patients. This shows the effectiveness of the Department policy that all must be vaccinated on employment or admission.

At Westfield we have lost Dr. Henry D. Chadwick who during his twenty years' service built and developed the institution, worked out the basis for the program of detecting tuberculosis among school children and directed this service during its first five years. He has been succeeded by Dr. Roy Morgan, for many years associated with Dr. Chadwick at Westfield, who in addition to being Superintendent has the very great responsibility for the X-ray in connection with the ten-year tuberculosis clinics which we are now calling the "Chadwick Clinics."

At Westfield the out-patient visits have increased to 1,341 so that we must have new quarters to handle this and the X-ray work. In addition we hope to have a separate home for our Superintendent here. The average stay in Westfield this year was eleven months.

At North Reading the average stay was nine and a half months. The out-patient service cared for 771 visits, and for this we will have new quarters in the admission and isolation building soon to be opened. In this there will also be special accommodations for infants and young children with tuberculosis for whom in the past it has been difficult to find hospital accommodations. We began the year with scarlet fever and following home visits by children at Easter whooping cough was brought in. This closed our sanatorium for eighteen weeks which was most disturbing in view of the waiting list. As a result we have obtained the admission and isolation building where new admissions will be held for two weeks. Further we have stopped allowing patients to go home at the various holidays. It is not fair to those waiting to get in. Also it will be well for the parents to realize, however robust and active their children may appear, that they are really sick children at a hospital and not well children given a pleasant outing at the expense of the State.

At Rutland the average stay is nearly a year. Of the 333 new admissions only 55 were classified as early and favorable, 136 as moderately advanced, while 131 were advanced, the rest being unclassified. Of course the large proportion of unfavorable cases came from Worcester and Middlesex, the other counties caring for these as the law requires in their own institutions. When Middlesex and Worcester have eventually built, the character of cases will change materially since the entire resources at Rutland will be open to those cases from the entire State that can benefit the most from them, namely the early favorable case.

This year 117 cases were given pneumothorax, an average of thirty-three treatments each. Through our consultant, Dr. Churchill, thoracic surgery was used in seventeen cases with good results. We hope this year for a surgical building

where these and other surgical demands in such an institution may be met, as well as furnishing adequate quarters for X-ray and dental service.

The Chadwick Clinics. — As a tribute to Dr. Henry D. Chadwick the Public Health Council voted to call the clinics held in the schools under the Department's ten-year program for the detection of juvenile tuberculosis the "Chadwick Clinics." Last spring we completed the first five years of this work. For the first three years we examined only children from families where there were known cases (contacts), those that were ten per cent or more underweight, and the "problem" children. Nearly 50,000 were so examined constituting about 15 per cent of all the children in the schools visited. Since it was felt that certain infected children that were not underweight were being missed, we have aimed to examine all children in the schools during the last two years and have actually reached another 50,000, representing about 60 per cent of the population of the schools visited.

Of the 101,118 children examined during these past five years, 98.5 per cent have been given the tuberculin test. Of these 28 per cent reacted, showing present or past infection with tuberculosis. Thirty-two per cent were X-rayed, which included certain special groups besides the reactors. Of the 28,071 reactors 0.1 per cent had pulmonary (adult type) tuberculosis, 2.5 per cent had hilum (childhood type) tuberculosis, and 5.4 per cent were placed in the suspicious group. That gives us eight per cent of the reactors or 7,954 children to be accounted for each year in our reexamination clinics, and of course that number grows annually.

Our five years' experience shows that the laboriously taken histories which made the advance work for the clinic so onerous are not worth the effort. Therefore all the children whose parents have given consent (this will probably mean about 60 per cent) are handled as follows: (1) All are given the tuberculin test; (2) these are read 72 to 96 hours later and the reactors' chests are X-rayed; (3) those showing pulmonary, hilum or suspected infection are given a careful physical examination with a complete history. The advantages of this are that a selected group comes up for physical examination and have their tuberculin test and X-ray already done and the results available for the examiner, and also in this way we can double the number of examinations by disposing of the negatives more promptly. The disadvantage is that the child's introduction to the clinic is through the tuberculin test rather than the history and physical examination and there is considerable parental aversion to having their children scratched that must be overcome. Our success will depend upon how much confidence the clinics have won during the past five years during which time they have been in almost every community in the State.

With this most ambitious of any of the present day large scale attacks on tuberculosis, which still is most killing to adolescents and young adults, we have a grave responsibility to evaluate results and make plans for the local perpetuation of such parts of the program as are of proven worth. To this end we have taken on an epidemiologist who is organizing a study of all the widely diversified tuberculosis data some of which go back 75 years, and which are probably more extensive than in any other state in the Union. On this we can base programs for the future.

Influenza. — At the time of writing the last annual report rumors of influenza elsewhere over the country were coming thick and fast. Although the inevitable hysteria had then reached us the epidemic did not arrive until the middle of January and lasted about a month. In collaboration with the United States Public Health Service studies of 15,000 persons in different parts of the State were made, and other data were collected. It seems that about a quarter of the population was sick with respiratory diseases (no one has yet answered the enigma of what is "influenza") and about an eighth had to remain in bed three days or more. It was about half as severe as 1920 and one-eighth as severe as 1918. This study has been reported.¹

Septic Sore Throat. — Eighty-four cases and two deaths were accounted for

¹ New England Journal of Medicine, Vol. 201, No. 10, pp. 474-478, Sept. 5, 1929.

by the Charlton outbreak in which the milker apparently infected his raw supply directly instead of through the intervention of an infected cow.¹

Rabies. — Nearly 5,000 dog bites have been reported to us and this probably represented less than half of what actually occurred. As the seriousness of the widespread prevalence of rabies was recognized through reporting it is safe to say that at least 5,000 received the Pasteur prophylactic inoculation. As fifty dollars is a conservative figure for the material and the fourteen to twenty-one inoculations at least a quarter of a million was spent in protection against this disease. An expensive monument to human futility! The solution is popular support of official effort to enforce licensing and the destruction of all stray dogs who keep rabies alive in our midst.

There were two human rabies deaths.

Malaria. — Of the 27 cases reported, 20 were contracted outside the State. However, we have been alive to the possible introduction of this disease through the importation of infected laborers to work on the Ware and Swift River tunnels extending the Metropolitan Water Supply. A summary of the way this has been handled is given elsewhere in this report by our Consulting Epidemiologist, Dr. Wilson G. Smillie.

Food Poisonings. — Eleven acute gastro-intestinal upsets, presumably food poisoning, which is the bugbear of the epidemiologist, were recognized. From three the dysentery bacillus was recovered. In the others the causative factor was undetermined. But from the New York State Health Department comes the suggestion that some of these may be of chemical rather than bacteriological origin, since cyanide is being used in certain commercial metal polishes. We have obtained the co-operation of local hotel associations in eliminating these products, but it is a matter that must be kept in mind though apparently not a factor in any of these outbreaks.

Gonorrhea and Syphilis. — Next to the common cold and its complications, gonorrhea and syphilis are the most important of the communicable diseases in Massachusetts. Yet because of the associated taboo they are most difficult of all diseases in which to use our knowledge effectively. As pointed out last year the Department is concentrating on the problem of making the resources for diagnosing and treating these diseases more readily available and more adequate while supporting to the full the admirable work of the Massachusetts Society for Social Hygiene in building up a sane and informed public opinion. In any final analysis the Society's work will be of more lasting benefit than ours if the people will but listen!

Based on four years' experience we are beginning with the new year the policy of having these diseases again reported directly to us. Apparently doctors are more willing to report gonorrhea and syphilis to the State than to the local health officials. Also we are at last following the example of the rest of the country in having these diseases reportable in all stages, rather than only when considered communicable. There is of course some protest, which is better than indifference, but so there was protest thirty years ago at reporting tuberculosis.

A lecture service for doctors has been built up and seven groups have been addressed. In these diseases the doctor has a unique public health responsibility, since, as they are not reported by name in the first instance, he alone stands between the infected individual and the potentially exposed public.

We are continuing our free distribution of arsenicals and our subsidy to clinics. With the Massachusetts Society for Social Hygiene we are taking part in a demonstration in the Lowell clinic of how the effectiveness of treatment may be increased by the addition of an alert, intelligent social worker. This should influence service elsewhere. With the aid of outstanding practitioners we are preparing printed matter for physicians and patients of an excellence far above much of the skimmed milk offered in the past. Next year at the New England Health Institute we hope to attract doctors to clinics and lectures on gonorrhea and syphilis which shall emphasize the diagnostic treatment and public health aspects of the problem, much as was done this year in the graduate course in cancer.

¹ American Journal of Public Health, Vol. XIX, No. 12, pp. 1339-1347, Dec., 1929.

District Health Officers. — Besides the inspectional work prescribed by law, the eternal conferences with local officials, investigations of the omnipresent outbreaks, the stimulation to adopting uniform communicable disease and milk regulations, the aiding and abetting in diphtheria immunization, and the interpreting of the Chadwick Clinics, new activities have been added unto them. They must interest what may be an already overwhelmed community in the proper use of cancer clinics, assist in organizing the Summer Round-Up of preschool children, and interest communities in and carry through health surveys. Eight of the latter have been done this year and after reading them one thinks that the noise in the streets must be the Boston Tea Party. Can such things be done and such things be left undone in the name of health in Massachusetts in 1929? It is good, however, that these things should be known if they exist, but if nothing is done the benefit is rather academic. In many instances the solution is the union health district already referred to. To accomplish this grouping of towns in health districts in the next few years is probably the greatest accomplishment that can be made by our District Health Officers or any of the rest of us in the Department to public health in Massachusetts.

Laboratories. — Besides the heavy routine work of the Diagnostic Laboratory, it has become more and more useful in our epidemiological investigations.

The Antitoxin and Vaccine Laboratory stood remarkably the enormous sudden demand for vaccine virus occasioned by the smallpox outbreak in Middleborough. Ninety thousand points were demanded and given within a few days. It is an astonishing organization that can absorb this. We plan next year to prepare and distribute tuberculin. We are now distributing pneumococcus antibody solution according to the Felton method to some of the larger hospitals for clinical trial. Should the clinical reports continue favorable, the production will be increased and general distribution under certain essential restrictions will be made. The Wassermann Laboratory is making a large number of examinations for contagious abortion in cattle for the Division of Animal Industry of the Department of Conservation, as well as carrying on the examinations of suspected rabid heads.

II. NON-COMMUNICABLE DISEASES.

With the creation of the Division of Adult Hygiene this year to carry the expanding cancer program, the former Division of Hygiene became the Division of Child Hygiene.

Child Hygiene. — In addition to a new director who is developing the work admirably we have added to our staff the position of Head Supervisor of Public Health Nursing. We have long felt the need of someone who would not only work out with us the nursing problems within the Department but, even more important, who would confer with and assist the many official and private organizations over the State employing public health nurses to work out problems connected with their field of activity and technique. We have appointed an Advisory Committee on Public Health Nursing and Social Work composed of Miss Ida M. Cannon, Miss Katherine McMahon, Miss Florence M. Patterson, Miss Gertrude W. Peabody, Miss Marion M. Rice and Dr. Wilson G. Smillie. They will help us see straight in developing intelligently the place of the nurse and the social worker in many of the old and the new problems that beset us.

With the administrative changes in our Chadwick Clinics certain nutritionists have been released. Of these one is following up the positive and suspicious cases in the homes while two are with the follow-up clinics which each year become more important. We are also using nutritionists in our well child conferences and for stimulating interest in malnutrition in the various communities visited by the Chadwick Clinics on the basis of data collected at these clinics. We are also studying the eternal problem of institutional dietary in our five hospitals.

Through our Nursing Supervisors we have organized Mother Study Clubs, the subject studied being family health. On this broad personal basis we should make a real contribution toward informed public opinion which is the objective of all our work. With the Massachusetts Tuberculosis League we are putting on a very promising demonstration of health education in the Lynn High Schools. With a

carefully selected control group we should have at the end of the demonstration something factual to show as to what is and what is not effective in health education. We are offering temporarily medical service to certain communities holding well child conferences with nurses only. Through demonstrating increased effectiveness we hope that these communities will permanently obtain such service, but it is not always easy since many doctors are neither interested nor effective in such work. Our Nursing Supervisors are organizing their local nurses into associations which meet monthly to discuss mutual problems. The advance towards uniformity of technique and professional stimulation which comes from such meetings is almost incalculable.

(a) *The Summer Round-Up.* — Perhaps one of the most vital interests of the Division of Child Hygiene is the Summer Round-Up since if effectively done it relieves the already overburdened schools of much of their load of defect correction and immunization, it undertakes this work at a younger age when it can more effectively and economically be done, and finally, it places these children at the threshold of their formal educational life more fit to learn, thus assuring a greater return on the very large investment and a reduction in the repeaters due to physical handicaps. This is inaugurated at the same time as Child Health Day, formerly May Day. These celebrations used to be limited to the æsthetic enjoyment of seeing unusually clean children skipping around the May Pole or otherwise disporting themselves calisthenically, while the physically handicapped were discreetly kept out of sight. Now it is used as the culmination of the year's health activities in the schools.

This year 261 towns expressed interest in Child Health Day to which His Excellency, the Governor, gave support through an effective broadcast. One hundred and ninety-five towns have reported holding Summer Round-Ups in which 12,864 children were examined, 5,765 defects were found. Figures for defects corrected are not yet available. As there are about 100,000 new children entering the schools each year this leaves much to be desired. But as much was probably done in private offices and clinics that was not recorded and as there is a marked increase in the number of communities taking part we may look forward hopefully to the future.

(b) *Dental Hygiene.* — Some dental service is given in about 225 communities, but this runs all the way from a well thought out educational program and preventive service to the younger children, as recommended in the Department's Dental Policy, to the old-fashioned plugging and pulling to those who cannot or will not pay for such service and which is really only a form of poor relief. About 55 communities employ dental hygienists.

As a part of the Summer Round-Up or independently, 228 communities have carried on dental campaigns and requested our educational material. One hundred communities report to us the percentage of correction of dental defects found.

(c) *Educational Material.* — Evidence of the general increased interest in child health is shown by the fact that 2,800,000 of the Division's pamphlets ranging all the way from the prenatal letter to the nutritional material for the adolescent were sent out. This represents an increase of about 20 per cent over last year. As the proportion of stony ground on which this material falls is probably no higher than formerly we may be encouraged by this increased interest.

Adult Hygiene. — In this field we have been principally engaged in expanding the cancer service of the last few years, although we are collecting data on the prevalence of and resources for the other important chronic diseases and have in preparation educational material as to control in this much larger and even more baffling field. We plan to develop this under an Advisory Committee on Adult Hygiene similar to our Advisory Committee on Cancer Clinics which has been of such inestimable value under the chairmanship of Dr. Robert B. Greenough.

Whether this radical expansion will end in a fiasco of futility because of our inability to limit our activities to those rather sparse fields where knowledge at present exists, or whether while seeking facts and assimilating new knowledge we can grow slowly and wholesomely is entirely for the future. However, in this

we will surely need from an Advisory Committee and others the quintessence of clear progressive thinking. In any case we may rest assured that if we fail to convince of our soundness on the one hand and of our ability to think progressively under rapidly changing conditions on the other, to some other governmental agency will be entrusted this problem which is perhaps the most important socially, medically and economically with which this State and this entire country is faced. There are 170,000 more persons over fifty (*i.e.*, in the chronic disease group) than there would have been had the age distribution of a generation ago held true. Again while the general death rate from the middle of the last century has fallen strikingly, advancing the average expectation of life some 19 years (from 39 to 58) the death rate over 50 has remained essentially stationary. On such fundamental facts as these is built popular unrest which can be controlled only by a conviction that everything reasonable is being done.

(a) *Cancer Clinics.* — Clinics under State aid have continued in seventeen cities and towns serving about 5,000 people over the past two years. This year although the total attendance has fallen 85 per cent, those found to have cancer has increased 120 per cent, totaling nearly 900. If we use the ratio found in our cancer campaign of last year, namely that for each person visiting the clinic 22 visited the private office of whom 14 per cent had cancer, we estimate that 6,500 cancer patients were seen in the private offices this year. This makes a total for private offices and clinics of 7,400 cancer cases seen this year, although it does not include those attending the many excellent clinics not receiving State aid. Thus we can feel that at least three-quarters of all the cancer existing in the State received medical attention this year. But how early and how adequately they were served we do not know except for our clinics.

To meet this very question the Massachusetts Medical Society with the co-operation of the American Society for the Control of Cancer and this Department offered a three day graduate course in cancer to all the physicians of the State. To the first day all dentists were invited. Fifteen clinics were offered in six different hospitals and the dental schools and dental infirmary. His Excellency, the Governor, spoke at the banquet. Nothing so compact and comprehensive on cancer has ever been offered in the State before. Few places in the country could equal it. The course was attended by 211 physicians and 199 dentists, which is a tribute to the interest and sense of responsibility that busy practitioners in these professions feel in regard to cancer. It must inevitably improve the general quality of the cancer service in the State. We plan this year to offer at the New England Health Institute somewhat broader clinic opportunities.

The cancer clinic staffs met together in Lowell in October.

(b) *Cancer Hospital.* — The Pondville Hospital, now in its third year of service to all forms of cancer, is maintaining a very high standard not always associated with governmental hospitals, and a keen interest on the part of its visiting staff of thirteen as shown by the fact that over 150 hours of visiting staff time is given to its 85 bed patients and the 90 persons visiting the clinic each month. There were 736 patients treated in the house and 1,097 in the clinic. This means that the X-ray, radium and operating facilities were in almost constant use, and well warrant the addition to the hospital which will give expanded clinic, surgical, radiological and laboratory facilities as well as adding 25 beds. To meet the problem of suitable attendant nursing staff we have started a course for training such attendants. This course will be expanded as experience indicates.

(c) *Cancer Education.* — However adequate the resources for early recognition and prompt treatment of cancer may be, they are as futile as the violin played in the desert unless properly used. So we have continued actively our cancer education which becomes increasingly difficult as cancer becomes an "old story." The education committees in communities with cancer clinics, our correspondents in communities without such clinics and the group of medical lectures have been of inestimable value. An enthusiastic meeting of all interested in cancer education and cancer social work was held in Worcester in November. These groups will be used as our chronic disease education expands.

Nearly 200,000 pamphlets were distributed to a large extent through the help

of enlightened industries. This is an increase of about 40 per cent. Twenty radio talks on cancer were given, 75 lectures were delivered and 3,500 newspaper articles were sent out. The effect of all this, we feel, is shown in the continued interest in the cancer work in spite of the hideous American demand for "something new."

(d) *Cancer and Chronic Disease Studies.*—From our studies of cancer deaths over 75 years we conclude that there is a sufficient correlation between social classes in England and nativity groups in Massachusetts to warrant the opinion that economic social conditions are a factor in the causation of cancer; the foreign born have a much higher rate than the native born of native parents in cancers of the mouth and stomach; the Irish and Italians show higher rates in Boston than in their native countries, etc.¹

A study of the data collected by the clinic social workers shows the following in regard to delay in first, visiting a physician, and, second, in starting treatment: There was an average of 6.5 months between first symptoms and first visit to a physician; men delayed longer than women except in skin cancer; the largest cause of delay was failure to realize that the early symptoms were of more than trivial importance (certainly this should be the principal objective of all our cancer education); 45 per cent of the cancer patients delayed six months before starting treatment, in 25 per cent of the cases due to poor medical advice (hence the reason for the Graduate Course in Cancer); the median interval of delay is increasing since 1927, in part due to the increased proportion of skin cancer coming to the clinics.

Studies of death returns from 1850 for all causes show: That while the crude death rate has decreased, that for the age groups over fifty has increased; the death rates for infections, tuberculosis, epilepsy, convulsions and sudden death in persons over 50 have a downward trend; those for cancer, diabetes, heart disease, appendicitis, nephritis, etc., have a consistent upward trend; for the other causes of death the rates are essentially unchanged.

As a basis for our adult hygiene program we must know the present prevalence of cases (rather than deaths) of chronic disease, their economic distribution, their interference with work, the resources for their diagnosis and treatment, the utilization and adequacy of the same, and the like. For this the following studies are under way: Chronic sickness house-to-house survey of 50,000 people in and about Brockton, Amherst, Greenfield and Shelburne Falls; questionnaire data from visiting nursing associations; data on the non-cancerous from our cancer clinic social workers; study of a group under the care of the Overseers of Public Welfare in Cambridge; different aspects of the matter through studies at the Massachusetts General Hospital, the Boston Dispensary, our Pondville Hospital and the like, surely a welter of material on a staggeringly vital matter out of which a few grains of gold will fall.

III. ENVIRONMENTAL CONTROL.

The task of supervising the public water supplies of the State which serve 96 per cent of our people has been made unusually difficult by the drought of this summer and fall which exceeds anything recorded in the last 33 years. The vulnerability of our many small supplies is strikingly demonstrated, and many of the situations will become more acute through this winter. If this period is passed without a marked increase in intestinal infections it will be a tribute to the care exercised over the temporary auxiliary supplies which in many instances could not be used except in the presence of an unusual emergency and under careful treatment. It is to be hoped that out of this many of our towns and cities will bestir themselves to obtain permanently a supply with a greater margin of safety.

Our Sanitary Engineering Division and our Division of Water and Sewage Laboratories have this year been collecting data on the pollution of Boston Harbor, a matter of very great magnitude. The study is being prosecuted over a two year period under a Legislative resolve involving a number of State, District and City departments.

¹ Cancer Studies in Massachusetts III: Cancer Mortality in Nativity Groups, Herbert L. Lombard and Carl R. Doering; *Journal of Preventive Medicine*, Vol. III, No. 5, Sept., 1929.

Recreation Sanitation. — On the advice of a committee representing the Massachusetts Association of Boards of Health, the New England Camp Directors Association and this Department, recommended standards in regard to sanitation, medical supervision and nutrition for summer camps were drawn up. These standards were sent to all known camp directors before the opening of the season. They have received quite universal approval and take the place of standards which would have been set under a camp licensing law as asked three years ago. It is entirely possible that these standards may be even more effective than another licensing would be.

Our examinations of market shellfish show a decided decrease in pollution over previous years. We believe that this is, in part at least, due to the increased vigilance of the Division of Fisheries and Game of the Department of Conservation, made possible through increased resources, and in part to our activities in prosecuting wholesale fish dealers handling polluted products.

Food Supervision. — In addition to the chemical analysis of 12,000 samples our Food and Drug laboratory has this year examined bacteriologically some 500 samples of milk. This we hope to expand since it is very near the heart of the problem of disease transmission by food. The milk inspection demonstration in Berkshire County mentioned in our last report and continued through the first half of this year showed this astonishing fact, namely, that the raw milk intended for pasteurization showed about half as high a bacterial count as the raw milk to be sold as such. Certainly in the Berkshires at least this answers unequivocally those critics who say that the purpose of pasteurization is to make a filthy and decomposed product potable. The only concrete advance in milk supervision in the Berkshires as a result of the septic sore throat epidemic which a year and a half ago sickened 1,000 and killed 48 is that Lee, Lenox and Stockbridge have united to employ a full time trained milk inspector with laboratory resources. This gives a quality of service utterly unknown there before, and if continued and expanded and emulated by other communities jointly may be of inestimable value to the public health. This is one phase of the union health district idea. Our continued inspection of pasteurizing plants under the admirable licensing law of three years ago shows that the vast majority of the plants are complying with the regulations of the Department designated to maintain the safety of the pasteurized milk on sale. There have inevitably been a few revocations and prosecutions under this law. We are more and more using our veterinary food inspectors in our epidemiological investigations in connection with suspected milkborne outbreaks.

Under the law requiring the Department to approve the nomination of local slaughtering inspectors (except in Boston) there have been this year more prosecutions and removals than formerly, in part due to the fact that this year an inspector has an automobile instead of depending on common carriers and can therefore cover more ground. As with milk inspection in Lee, Lenox and Stockbridge, the quality of slaughtering inspection could be vastly improved if the towns were to combine and establish centralized slaughtering houses. Thus better trained men could be obtained and reasonable compensation paid. This again is another aspect of the union health district idea.

IV. PERSONNEL.

The organization of the Public Health Council has not changed during the past year, the Governor having reappointed Dr. Strong and Mr. Tighe at the expiration of their terms.

Through death the Department and the Commonwealth have lost two valuable chemists who have given long and meritorious service, in the passing of Mr. Fred B. Forbes, Chief of Laboratory of the Division of Water and Sewage Laboratories and Mr. Clarence E. Marsh, Senior Chemist of the Division of Food and Drugs. Mr. Arthur R. G. Booth and Mr. Lewis I. Nurenberg, respectively, have been appointed to their places.

On January 15, as announced last year, Dr. M. Luise Diez succeeded Dr. Champion as Director of the Division that is now Child Hygiene.

In June Dr. Herbert L. Lombard, formerly Epidemiologist in charge of the Cancer Section, became Director of the Division of Adult Hygiene.

In June Dr. Edward A. Lane was promoted from Health Officer of the Metropolitan District to the new position of Assistant Director of the Division of Communicable Diseases. The vacancy thus created was filled in October by the appointment of Dr. Charles B. Mack.

In June Dr. Roy Morgan was appointed Superintendent of the Westfield State Sanatorium to succeed Dr. Henry D. Chadwick.

In September Dr. George M. Sullivan was appointed Superintendent of the Pondville Hospital to succeed Dr. Lyman Asa Jones. Dr. Sullivan had been Health Officer in the Northeastern District and was here succeeded by Dr. Wilson W. Knowlton.

In June Dr. Wilson G. Smillie was appointed as Epidemiological Consultant to the Department.

Dr. Gaylord W. Anderson was appointed as Epidemiologist in the Division of Communicable Diseases in August to succeed Dr. Forsbeck.

In November Dr. Alton S. Pope was appointed Epidemiologist in the Division of Tuberculosis.

Mr. Louis N. Phaneuf was promoted to the position of Assistant Director of the Division of Tuberculosis in June, and Dr. David Zacks was transferred to the position of Supervisor of Tuberculosis Clinics in charge of the follow-up work. Miss Mary L. Herman was promoted at this time to the position of Inspector of Settlements and Support Claims made vacant by Mr. Phaneuf's promotion.

In June Miss Eleanor E. Kelly of the Division of Adult Hygiene was promoted to Supervisor of Social Service for the Department.

Miss Mary P. Billmeyer was appointed in November as Head Supervisor of Public Health Nursing in the Division of Child Hygiene.

V. ORGANIZATION.

The organization of the Department is as follows:

Commissioner of Public Health	George H. Bigelow, M.D.	
Public Health Council		6
Division of Administration:		
Secretary (1), Epidemiological Consultant (1), Statistical Consultant (1), Clerks and Stenographers (11)		14
Division of Adult Hygiene:		
Herbert L. Lombard, M.D., Director.		
Epidemiologist (1), Social Workers (2), Public Health Education Workers (2), Clerks and Stenographers (14)		20
Division of Biologic Laboratories:		
Benjamin White, Director.		
Assistant Director (1), Chemists and Bacteriologists (8), Laboratory Assistants (2), Laboratory Helpers (11), Stable Foreman (1), La- borers (13), Janitors (2), Clerks and Stenographers (3).		
(Wassermann Laboratory):		
Chief of Laboratory (1), Bacteriologists (3), Laboratory Helpers (4), Clerks and Stenographers (3)		53
Division of Communicable Diseases:		
Clarence L. Scamman, M.D., Director and Deputy Commissioner.		
Assistant Director (1), District Health Officers (6), Epidemiologist (1), Clerks and Stenographers (6).		
(Diagnostic Laboratory):		
Bacteriologists (4), Laboratory Assistant (1), Laboratory Helper (1), Laborer (1), Clerks and Stenographers (6).		
(Venereal Disease):		
Epidemiologist (1), Public Health Social Hygiene Supervisors (2), Public Health Education Worker (1), Clerk and Stenographer (1)		33

Division of Food and Drugs:
Hermann C. Lythgoe, Director.
Chemists (6), Veterinary Inspectors (3), Food Inspectors (6), Laboratory Helpers (4), Clerks and Stenographers (8) 28

Division of Child Hygiene:
M. Luise Diez, M.D., Director.
Dental Hygiene Supervisor (1), Public Health Nutrition Workers (6), Public Health Education Workers (2), Clerks and Stenographers (7), Child Welfare Physician (1).
(Maternal and Child Hygiene):
Child Welfare Physician (1), Public Health Nursing Supervisors (5), Clerks and Stenographers (7) 31

Division of Sanitary Engineering:
X. H. Goodnough, Chief Sanitary Engineer.
Engineers and Engineering Assistants (12), Clerks and Stenographers (11) 24

Division of Tuberculosis:
Sumner H. Remick, M.D., Director.
Assistant Director (1), Epidemiologists (2), Superintendent of Sanatoria Construction (1), Inspector of Settlements and Support Claims (1), Social Worker (1), Field Nurses (4), Clerks and Stenographers (7).
(Tuberculosis Clinics):
Supervisor of Tuberculosis Clinics (2), Child Welfare Physicians (4), Field Nurses (3), X-Ray Clinic Field Agent (1), X-Ray Technician (1), Clerks and Stenographers (6) 35

Division of Water and Sewage Laboratories:
Harry W. Clark, Director.
Chief of Laboratory (1), Chemists and Bacteriologists (9), Laboratory Assistant (1), Laboratory Helper (1), Mechanical Handyman (1), Laborer (1), Clerks and Stenographers (2) 17

Total 262

The quota of employees at each of the institutions under the supervision of the Department is as follows:

Lakeville State Sanatorium	150
North Reading State Sanatorium	127
Rutland State Sanatorium	208
Westfield State Sanatorium	148
Pondville Hospital	104
	<hr/> 737
Grand total for the Department	999

VI. PUBLICATIONS.

The following articles by members of the staff have been published:

Division of Administration.

Enlarging Cancer Program
Dr. George H. Bigelow
New England Journal of Medicine, January 17, 1929

Is the State's Cancer Program State Medicine?
Dr. George H. Bigelow
New England Journal of Medicine, February 28, 1929

Typhoid Fever in Massachusetts
Dr. George H. Bigelow and Dr. Carl R. Doering
American Journal of Hygiene, March, 1929

The Cancer Program in Massachusetts

Dr. George H. Bigelow

Campaign Notes of the American Society for the Control of Cancer, April, 1929

Epidemic Septic Sore Throat; Review of 1928 Epidemic in Massachusetts

Dr. George H. Bigelow and Dr. Benjamin White

New England Journal of Medicine, April 18, 1929

Report of Graduate Course in Cancer

Dr. Franklin G. Balch, Dr. George H. Bigelow, and Dr. Robert B. Greenough

New England Journal of Medicine, July 25, 1929

Respiratory Tract Infections in Massachusetts in Winter of 1928-1929

Dr. George H. Bigelow and Dr. Herbert L. Lombard

New England Journal of Medicine, September 5, 1929

Division of Adult Hygiene.

Septic Sore Throat in 1929 in Massachusetts: Epidemiology

Dr. Herbert L. Lombard

The Journal of Preventive Medicine, March, 1929

Hospitalization Problem in Wayland

Dr. Herbert L. Lombard and Marie R. Giblin

New England Journal of Medicine, May 23, 1929

The Massachusetts Cancer Program

Dr. Herbert L. Lombard

The Rhode Island Medical Journal, August, 1929

Cancer Studies in Massachusetts. 3. Cancer Mortality in Nativity Groups

Dr. Herbert L. Lombard and Dr. Carl R. Doering

The Journal of Preventive Medicine, September, 1929

A series of papers given at Graduate Course in Cancer, published in New England Journal of Medicine, December 19 and 26, 1929

Division of Communicable Diseases.

An Outbreak of Gastro-Intestinal Disturbance Following the Eating of Chocolate Cream Pie

Dr. Nels A. Nelson

New England Journal of Medicine, December 6, 1928

Outbreak of Typhoid Fever Traced to a Carrier

Dr. Filip C. Forsbeck

New England Journal of Medicine, December 13, 1928

An Outbreak of Typhoid Fever Traced to Chicken Salad Infected by a Carrier

Dr. Harold E. Miner and Dr. Filip C. Forsbeck

New England Journal of Medicine, February 28, 1929

Minimum Standards for the Diagnosis, Treatment and Control of Syphilis

New England Journal of Medicine, May 16, 1929

Carriers of Streptococcus Hemolyticus in relation to Control of Scarlet Fever in Schools

Dr. Edward A. Lane and Edith A. Beckler, S.B.

New England Journal of Medicine, June 20, 1929

An Outbreak of Mild Smallpox

Dr. Richard P. MacKnight and Dr. Clarence L. Scamman

New England Journal of Medicine, August 22, 1929

A Chart to Estimate Percentage Change

Dr. Filip C. Forsbeck

New England Journal of Medicine, September 19, 1929

Milk-Borne Septic Sore Throat and Scarlet Fever

Dr. Clarence L. Scamman

American Journal of Public Health, December, 1929

*Division of Biologic Laboratories
(Antitoxin and Vaccine Laboratory).*

Epidemic Septic Sore Throat

Dr. Benjamin White and Dr. May Salona Holmes

New England Journal of Medicine, April 18, 1929

Bacteriological Study of Hemolytic Streptococci from a Massachusetts Outbreak of Septic Sore Throat in 1928

Dr. Elliott S. Robinson and Edith A. Beckler, S.B.

Journal of Preventive Medicine, May, 1929

The Buffered Diluent for Schick Toxin

Dr. William E. Bunney and Dr. Benjamin White

Proceedings of the Society for Experimental Biology and Medicine, 1929

Serums and Vaccines in the Prevention and Treatment of Disease

Dr. Benjamin White

Annals Internal Medicine, October, 1929

(Wassermann Laboratory.)

The Hinton Glycerol Cholesterol Agglutination Reaction. Modifications in Technic

Dr. William A. Hinton and Genevieve O. Stuart

Journal of Laboratory and Clinical Medicine, April, 1929

A Glycerol Modification of the Kahn Test

Dr. William A. Hinton and Dr. Arthur Berk

New England Journal of Medicine, October 3, 1929

Division of Sanitary Engineering.

Some Legal Aspects of the Financial Management of Water Works in Massachusetts

Arthur D. Weston

Journal of the New England Water Works Association, September, 1929

Division of Child Hygiene.

The Value of Nutrition in the Work of the Public Health Nurse

Esther V. Erickson

The Trained Nurse and Hospital Review, April, 1929

Painless Dentistry

Eleanor Gallinger McCarthy

The American Public Health Association, Health Education Service, April, 1929

Dental Hygiene in Massachusetts

Eleanor Gallinger McCarthy

Journal of American Dental Hygienists' Association, July, 1929

The Preschool Child and the Dentist

Dr. Susan M. Coffin

Journal of the American Dental Association, July, 1929

Judging Success of a Dental Program

Eleanor Gallinger McCarthy

American Journal of Public Health, August, 1929

Division of Tuberculosis.

Tuberculosis Reporting and Tuberculosis Mortality

Dr. David Zacks

New England Journal of Medicine, May 16, 1929

Division of Water and Sewage Laboratories.

Sludge Digestion and pH Control

Harry W. Clark and George O. Adams
Industrial and Engineering Chemistry, March, 1929

Effect of Certain Acids on Sludge Digestion

Harry W. Clark and George O. Adams
Sewage Works Journal, July, 1929

Iodine in Water, Food and Urine

Harry W. Clark and George O. Adams
American Public Health Association, August, 1929

VII. NEW LEGISLATION.

The Department is submitting the following proposed legislation:

Relative to Milk.

A recent study indicates that 46 per cent of towns between 5,000 and 25,000 population have no milk inspector, even part time. In general these are the communities where the largest proportion of the milk is sold raw. Yet for this, the most important single food that we have, the one given most to children, the one most susceptible to contamination and in regard to the handling of which the most meticulous care must be shown, for this food there is no one actively responsible in these towns. The milk dealers should be the first to insist on such inspection for their own protection.

Again, in some other cities and towns the inspectors are untrained, disinterested or worse. Thus the Department asks in this bill that all cities and towns with a population over 5,000 be required to have at least one inspector; that such inspector be nominated by the local board of health; and that approval of such nomination be required by the State Department of Public Health as is now the case with slaughtering inspectors.

For the fifth consecutive year the Department is requesting that after a reasonable period all milk in cities and towns with a population of more than 5,000 shall be either pasteurized or from non-tuberculous cattle. In towns under 5,000 the act may be adopted at a town meeting.

Still about a million of our people, many of them children, drink raw milk daily. Although progress is being made, Massachusetts is among the states showing the highest proportion of tuberculous cattle. We spend millions in the diagnosis and treatment of tuberculosis. This continued infection of our people through our milk must stop!

Relative to Tuberculosis Subsidy.

The State is paying for hospitalization of the tuberculous some \$300,000 each year. This goes to cities and towns at the rate of \$5 per week per patient. Aside from this hospitalization many of these communities are doing nothing in tuberculosis control. They offer nothing adequate in the way of clinic service so that cases may be recognized in time to effect a cure in the hospital. They are doing nothing in the way of case finding, such as examining all the other members of a family, particularly the children, where a case has occurred. Yet by the age of five a child from such a family has a 50 per cent chance of being infected. They are offering no special privileges in the schools to children needing them as indicated by our State clinics. They are doing nothing effective in follow-up so that deleterious influences in industry, office and home may be avoided and relapse may be recognized early should it occur. These communities deserve no subsidy from the State or anyone else.

In this bill the Department asks authority to set minimum standards for tuberculosis service by cities and towns, and to be authorized to pay subsidy only to such communities as may meet this standard. At least at first this will save the State some money. But vastly more important, the threat of withdrawing funds will raise some cities and towns out of their lethargy and indifference to tuberculosis.

Relative to Vaccination.

This year we had more smallpox than in any year since 1903, while our entire country is striving to better its 1928 record when it was more smallpox ridden than any country in the world except India. If any fact in the entire field of public health is established it is that compulsory vaccination is the only way to permanently keep out this disease. The shortcomings in our public school vaccination law, as has been indicated at each session of the Legislature now for thirteen years, was demonstrated this year. Therefore, the Department is introducing a bill drawn on lines that have proven effective in other countries of the world. This would require vaccination of all infants before the end of the first year and revaccination early in their school life. This is the solution of smallpox, rather than vaccination clinics after the disease has sickened many, closed schools and disrupted the economic life of the community, as we saw done this year.

FINANCIAL STATEMENT.

Appropriations and Expenditures for the Year ended November 30, 1929.

	Total Appropriation, Plus Amounts Brought Forward.	Expenditures to Nov. 30, 1929.
Lakeville State Sanatorium	\$250,307 76	\$239,798 78
North Reading State Sanatorium	227,700 73	219,395 89
Pondville Hospital	199,121 31	192,678 92
Rutland Sanatorium	334,657 83	323,319 49
Westfield Sanatorium	266,965 74	253,359 31

SPECIAL APPROPRIATIONS.

	Total Appropriation.	Expenditures to Nov. 30, 1929.
Lakeville:		
Acts 1929, Chapter 146, Item 587, "Addition to Fire Protection"	\$8,700 00	\$4,714 67
Acts 1929, Chapter 146, Item 588, "Children's Building"	132,500 00	23,110 83
North Reading:		
Acts 1929, Chapter 146, Item 590, "Admission and Isolation Bldg."	172,000 00	38,850 47
Acts 1929, Chapter 146, Item 591, "Power House Alterations"	19,000 00	15,282 08
Acts 1929, Chapter 146, Item 592, "Improving Water Supply"	21,000 00	18,625 50
Pondville:		
Acts 1929, Chapter 146, Item 598, "Hospital and Out-Patient Dept."	78,000 00	19,629 54
Acts 1929, Chapter 146, Item 599, "Automatic Sprinklers"	2,500 00	12 72
Acts 1929, Chapter 146, Item 600, "Improvements to Sewer Beds"	1,200 00	1,187 88
Rutland:		
Acts 1929, Chapter 146, Item 594, "Water Supply and Sprinklers"	15,000 00	63 76
Westfield:		
Acts 1929, Chapter 146, Item 596, "Improving Water Supply and Fire Protection"	10,700 00	1,165 48

Appropriations and Expenditures for the Year ended November 30, 1929.

	Appropriations.	Expended.
Division of Administration	\$40,500 00	\$36,246 54
Cancer Clinics	63,900 00	62,330 89
Division of Hygiene	49,600 00	49,047 44
Maternal and Child Hygiene	31,900 00	31,420 52
Division of Communicable Diseases	84,200 00	81,157 93
Veneral Diseases	46,300 00	40,812 56
Division of Food and Drugs	73,300 00	68,857 52
Administration of Shellfish Law	3,000 00	3,000 00
Division of Biologic Laboratories:		
Antitoxin and Vaccine Laboratory	102,900 00	102,593 75
Wassermann Laboratory	21,100 00	20,626 06
Division of Sanitary Engineering	84,800 00	82,083 48
Division of Water and Sewage Laboratories	49,395 00	47,461 83
Division of Tuberculosis	45,700 00	42,492 06
Subsidies to Cities and Towns	245,000 00	244,976 68
Tuberculosis Clinic Units	67,000 00	63,597 63
Totals	\$1,008,595 00	\$976,704 89

Special Appropriations and Expenditures for the Year ended Nov. 30, 1929.

	Appropriations.	Expended.
Investigation, Barbering, Chapter 43, Resolves of 1929	\$3,000 00	\$2,879 04
Investigation, Coastal Waters of Barnstable, Dukes and Nantucket Counties, Chapter 312, Acts of 1929	3,000 00	1,216 92
Investigation, Plumbing Laws, Chapter 16, Resolves of 1929	500 00	112 88
Totals	\$6,500 00	\$4,208 84

GEORGE H. BIGELOW, M.D.,
Commissioner of Public Health.

REPORT OF THE DIVISION OF SANITARY ENGINEERING.

X. H. GOODNOUGH, *Director and Chief Engineer.*

OVERSIGHT AND CARE OF INLAND WATERS.

Water Supply and Sewerage.

During the year 1929 480 applications were received by this Department for the approval of plans for systems of water supply, drainage and sewerage and for the advice of the Department relative thereto. This number was nearly 10% greater than was received during any previous year. Of this number 365 related to water supply, 9 to sources of ice supply, 28 to sewage and sewage disposal, 13 to pollution of streams, and 65 to miscellaneous matters.

A new water supply was introduced during the year into the town of Chatham by the Chatham Water Company, and the total number of cities and towns supplied with water from public works at the end of the year 1929 was 223 out of the total of 355 cities and towns in the State.

The rainfall for the year 1929 amounted to 41.69 inches, or 2.79 inches below the normal as determined from observations at eight stations in different parts of the State having rainfall records for more than 50 years. The rainfall was in excess of the normal in the months of January, February, April, May and December and less than the normal in all other months. The aggregate precipitation for the months from June to November, inclusive, was more than 30% less than the normal. The deficiency in the rainfall caused shortages in the public water supply in twenty-four places in the State, and in the following places it became necessary to take water from an emergency source of supply:

Brookfield	North Adams
Colrain	Northborough
Deerfield (Deerfield Fire District)	Northfield
Millbury (Millbury Water Company)	Pittsfield
Monson	Shelburne (Shelburne Falls Fire District)
Monterey	

SANITARY PROTECTION OF PUBLIC WATER SUPPLIES.

At the request of the water department of the town of Westborough rules and regulations were adopted for the protection of the sources of water supply of that municipality. Rules and regulations were also readopted for protecting the water supply of the town of Hudson and that of the Housatonic Water Company, Great Barrington, there having been some question as to the legality of the publication of the rules previously adopted by this Department for the protection of these sources of supply.

The cities, towns and fire and water districts for which rules and regulations have now been established for the sanitary protection of their public water supplies are the following:

Abington and Rockland	Dalton	Hudson
Adams	Danvers and Middleton	Lakeville (State Sanatorium)
Amherst	Easthampton	Lee
Andover	Fall River	Leicester (Cherry Valley and Rochdale)
Ashburnham	Falmouth	Leominster
Ashfield	Fitchburg	Lincoln and Concord
Attleboro	Gardner	Lynn
Braintree	Great Barrington	Marlborough
Brockton and Whitman	(Housatonic)	Maynard
Cambridge	Greenfield	Medfield (State Hospital)
Chester	Haverhill	Metropolitan Water District
Chicopee	Hingham and Hull	Milford
Cohasset	Holden	
Concord	Holyoke	

Montague	Randolph and Holbrook	Wakefield
Newburyport	Rockport	Westborough
Norfolk (State Hospital)	Russell	Westfield
Northampton	Rutland	West Springfield
North Andover	Salem and Beverly	Weymouth
Northborough	Scituate	Williamsburg
Norwood	Springfield	Winchester
Peabody	Springfield and Ludlow	Worcester
Pittsfield	Stockbridge	
Plymouth	Taunton	

Connection of Auxiliary Fire Supplies with Public Water Supply Systems.

The examinations of connections between the water pipes of private fire supplies, or manufacturing or other supplies, used in factories or other establishments and the pipes of public water supplies have been continued during the year with the view of eventually eliminating such connections. The work progresses slowly since much of the time of the trained personnel available for this work has been consumed in the installation of water supply for fire protection at the institutions under the supervision of this Department.

EXAMINATION OF PUBLIC WATER SUPPLIES.

Examinations have been made of many of the sources of water supply in the State during the past year and the condition of the waters in nearly all of these sources has been determined by analyses. The average yearly results of the chemical analyses of the sources of supply during the year 1929 are given in the following table:

Analyses of the Water of Public Water Supplies.

Averages of Chemical Analyses of Surface-Water Sources for the Year 1929.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.	
				Free.	ALBUMINOID.				
					Total.	Sus- pended.			
Metropolitan Water Dis- trict	Wachusett Reservoir, upper end	.28	4.03	.0017	.0115	.0026	.24	1.0	
	Wachusett Reservoir, lower end	.16	3.68	.0014	.0102	.0023	.25	1.1	
	Sudbury Reservoir	.19	3.82	.0011	.0124	.0035	.28	1.3	
	Framingham Reservoir No. 3	.19	4.26	.0010	.0126	.0025	.29	1.5	
	Hopkinton Reservoir	.48	4.46	.0013	.0126	.0025	.32	1.1	
	Ashland Reservoir	.46	4.67	.0013	.0142	.0027	.39	1.1	
	Framingham Reservoir No. 2	.53	5.95	.0024	.0182	.0037	.58	1.7	
	Lake Cochituate	.21	7.53	.0057	.0161	.0034	.85	2.9	
	Chestnut Hill Reservoir	.17	4.37	.0012	.0101	.0024	.30	1.4	
	Weston Reservoir	.16	4.46	.0011	.0104	.0021	.28	1.4	
	Spot Pond	.12	4.18	.0012	.0106	.0019	.31	1.4	
	Tap in State House	.17	4.32	.0007	.0105	.0028	.30	1.3	
	Tap in Revere	.10	4.14	.0004	.0098	.0023	.31	1.5	
	Tap in Quincy	.14	4.16	.0003	.0078	.0016	.31	1.5	
	Abington	Big Sandy Pond	.09	4.00	.0032	.0101	.0016	.82	0.5
		Adams (Fire District)	Dry Brook	.06	7.66	.0003	.0035	.0011	.14	5.3
	Amherst	Bassett Brook	.06	7.66	.0010	.0033	.0008	.13	5.5
Amethyst Brook large reservoir		.33	4.02	.0019	.0082	.0022	.18	0.9	
Andover	Amethyst Brook small reservoir	.15	4.29	.0015	.0122	.0030	.20	0.6	
	Haggett's Pond	.15	4.52	.0039	.0153	.0036	.43	1.6	
Ashburnham	Upper Naukeag Lake	.08	2.94	.0020	.0050	.0013	.15	0.5	
Ashfield	Bear Swamp Brook	.35	6.07	.0006	.0089	.0020	.16	3.4	
Athol	Phillipston Reservoir	.52	3.63	.0041	.0231	.0082	.16	0.9	
	Buckman Brook Reservoir	.18	3.31	.0008	.0218	.0114	.14	0.8	
	Thousand Acre Meadow Brook	1.21	4.82	.0032	.0221	.0041	.16	0.9	
	Inlet of filter	.18	3.32	.0042	.0133	.0041	.14	0.7	
	Outlet of filter	.17	3.52	.0023	.0099	.0023	.14	0.7	
Barre	Reservoir	.13	5.35	.0032	.0111	.0026	.19	1.5	
Blackstone	Tap (supply from Woonsocket, R. I.)	.00	4.90	.0000	.0056	-	.31	0.8	
Blandford (Fire District)	Freeland Brook	.06	4.20	.0004	.0016	.0003	.20	1.2	
Brockton	Silver Lake	.09	4.05	.0013	.0117	.0028	.59	0.7	
Brookfield	Cooley Hill Reservoir	.08	4.78	.0025	.0176	.0046	.27	1.1	

Averages of Chemical Analyses of Surface-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus- pended.		
CAMBRIDGE	Lower Hobbs Brook Reservoir . . . . .	.19	5.49	.0026	.0188	.0032	.48	2.4
	Upper Hobbs Brook Reservoir . . . . .	.39	6.20	.0029	.0223	.0042	.47	2.5
	Stony Brook Reservoir . . . . .	.32	6.74	.0020	.0188	.0030	.56	2.7
	Fresh Pond . . . . .	.10	9.06	.0043	.0186	.0049	.75	4.5
Cheshire	Thunder Brook . . . . .	.02	8.02	.0004	.0021	.0008	.11	5.6
	Kitchen Brook . . . . .	.04	7.50	.0007	.0021	.0007	.11	4.6
Chester (Fire District)	Austin Brook Reservoir . . . . .	.11	5.05	.0014	.0081	.0015	.14	1.7
	Horn Pond . . . . .	.13	4.58	.0023	.0224	.0117	.14	1.7
CHICOPEE	Morton Brook . . . . .	.05	5.25	.0012	.0035	.0011	.32	1.7
	Cooley Brook . . . . .	.31	5.08	.0066	.0132	.0056	.22	1.6
Clinton	Tap in town . . . . .	.17	3.55	.0005	.0122	.0027	.20	0.9
Colrain (Griswoldville)	McClellan Reservoir . . . . .	.09	8.52	.0029	.0067	.0011	.18	4.6
Colrain (Fire District No. 1)	Mountain Brook Reservoir . . . . .	.04	10.57	.0003	.0033	.0005	.13	6.6
Concord	Nagov Pond . . . . .	.07	3.31	.0038	.0123	.0033	.40	0.6
Dalton (Fire District)	Egypt Brook Reservoir . . . . .	.15	3.41	.0010	.0070	.0015	.10	0.9
	Windsor Reservoir . . . . .	.17	6.27	.0033	.0129	.0027	.14	2.7
	Cady Brook . . . . .	.18	5.19	.0015	.0093	.0014	.13	2.5
Danvers	Middleton Pond . . . . .	.59	4.48	.0044	.0186	.0033	.41	1.5
	Swan Pond . . . . .	.30	4.87	.0022	.0172	.0041	.38	1.7
Deerfield (South Deerfield Water Supply District)	Roaring Brook . . . . .	.04	6.76	.0006	.0034	.0009	.16	3.7
Egremont (South)	Goodale Brook . . . . .	.02	4.78	.0003	.0013	.0003	.11	3.1
FALL RIVER	North Watuppa Lake . . . . .	.09	3.86	.0032	.0124	.0026	.52	0.7
Falmouth	Long Pond . . . . .	.04	4.42	.0013	.0066	.0009	1.04	1.2
FITCHBURG	Meetinghouse Pond . . . . .	.07	3.29	.0034	.0129	.0023	.20	0.7
	Scott Reservoir . . . . .	.11	3.09	.0059	.0177	.0050	.20	0.5
	Wachusett Lake . . . . .	.10	3.01	.0034	.0108	.0030	.16	0.5
	Falulah Brook . . . . .	.16	3.29	.0021	.0086	.0023	.18	0.5
	Ashby Reservoir . . . . .	.25	3.27	.0038	.0138	.0035	.16	0.5
GARDNER	Crystal Lake . . . . .	.10	5.42	.0016	.0130	.0023	.34	2.1
GLOUCESTER	Dike's Brook Reservoir . . . . .	.33	4.74	.0028	.0105	.0020	.88	0.5
	Wallace Reservoir . . . . .	.36	5.15	.0046	.0147	.0032	.91	0.6
	Haskell Brook Reservoir . . . . .	.09	4.29	.0013	.0083	.0027	.77	0.5
Great Barrington (Fire District)	East Mountain Reservoir . . . . .	.08	5.87	.0015	.0065	.0022	.14	3.3
Great Barrington (Housatonic)	Long Pond . . . . .	.08	7.80	.0046	.0182	.0024	.16	6.7
Greenfield	Glen Brook Upper Reservoir . . . . .	.05	7.03	.0052	.0073	.0020	.18	3.8
	Glen Brook Lower Reservoir . . . . .	.03	6.32	.0015	.0069	.0013	.16	3.5
Hadley (Water Supply District)	Hart's Brook Reservoir . . . . .	.13	5.85	.0005	.0060	.0016	.18	2.3
Hatfield	Running Gutter Brook Reservoir . . . . .	.08	8.03	.0005	.0029	.0012	.24	3.0
HAVERHILL	Johnson's Pond . . . . .	.14	5.72	.0016	.0143	.0021	.42	2.3
	Crystal Lake . . . . .	.15	4.13	.0018	.0136	.0024	.37	1.5
	Kenoza Lake . . . . .	.16	5.15	.0033	.0160	.0040	.41	2.0
	Lake Saltonstall . . . . .	.09	6.74	.0025	.0168	.0035	.59	2.6
	Pentucket Lake . . . . .	.11	4.72	.0015	.0139	.0028	.39	2.0
	Millvale Reservoir . . . . .	.45	5.71	.0012	.0167	.0042	.39	2.1
Hingham	Accord Pond . . . . .	.15	3.99	.0015	.0103	.0018	.55	0.7
	Fulling Mill Pond . . . . .	.29	5.52	.0069	.0232	.0080	.75	1.5
Hinsdale (Fire District)	Reservoir . . . . .	.13	2.42	.0017	.0087	.0017	.10	0.5
HOLYOKE	Whiting Street Reservoir . . . . .	.07	5.74	.0018	.0160	.0038	.22	3.1
	Fomer Reservoir . . . . .	.19	4.20	.0022	.0144	.0040	.16	1.1
	Wright and Ashley Pond . . . . .	.10	5.39	.0015	.0130	.0034	.17	2.6
	High Service Reservoir . . . . .	.11	4.05	.0009	.0128	.0027	.15	1.5
	White Reservoir . . . . .	.18	4.18	.0044	.0163	.0039	.15	1.6
Hudson	Gates Pond . . . . .	.08	3.60	.0021	.0123	.0025	.25	1.4
Huntington (Fire District)	Cold Brook Reservoir . . . . .	.06	3.40	.0004	.0023	.0005	.13	1.2
Ipswich	Dow's Brook Reservoir . . . . .	.20	5.94	.0031	.0190	.0043	.63	2.3
	Bull Brook . . . . .	.66	7.80	.0033	.0193	.0034	.63	3.0
LAWRENCE	Merrimack River, filtered . . . . .	.38	6.25	.0078	.0112	—	.66	2.3
Lee	Codding Brook Upper Reservoir . . . . .	.10	5.25	.0005	.0044	.0013	.10	3.2
	Codding Brook Lower Reservoir . . . . .	.11	5.55	.0007	.0054	.0011	.10	3.3
	Basin Pond Brook . . . . .	.24	4.78	.0006	.0043	.0010	.11	1.8
Lenox	Lower Root Reservoir . . . . .	.07	7.50	.0006	.0053	.0017	.10	6.4
	Woolsey Reservoir . . . . .	.06	6.25	.0006	.0097	.0041	.11	4.6
LEOMINSTER	Morse Reservoir . . . . .	.16	2.86	.0020	.0127	.0032	.16	0.5
	Haynes Reservoir . . . . .	.15	2.84	.0037	.0163	.0040	.15	0.5
	Fall Brook Reservoir . . . . .	.12	3.30	.0012	.0109	.0026	.17	0.5
Lincoln	Sandy Pond . . . . .	.04	3.38	.0018	.0101	.0031	.29	0.9
Longmeadow	Cooley Brook . . . . .	.10	6.00	.0075	.0104	.0033	.26	2.8
LYNN	Birch Reservoir . . . . .	.15	5.47	.0093	.0155	.0037	.76	1.9
	Breed's Reservoir . . . . .	.29	5.93	.0041	.0143	.0025	.74	2.2
	Walden Reservoir . . . . .	.35	6.29	.0031	.0145	.0028	.43	2.3
	Hawkes Reservoir . . . . .	.37	6.35	.0061	.0166	.0030	.70	2.5
Manchester	Gravel Pond . . . . .	.11	4.27	.0008	.0139	.0056	.78	1.3

Averages of Chemical Analyses of Surface-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.			Chlorine.	Hardness.
				Free.	ALBUMINOID.			
					Total.	Sus- pended.		
MARLBOROUGH . . .	Lake Williams . . .	.09	5.31	.0045	.0155	.0036	.59	2.1
	Millham Brook Reservoir . . .	.42	5.81	.0041	.0165	.0027	.41	1.9
Maynard . . .	White Pond . . .	.11	3.32	.0008	.0109	.0021	.27	0.6
Milford . . .	Charles River, filtered . . .	.22	5.52	.0009	.0050	-	.31	2.6
Montague . . .	Lake Pleasant . . .	.07	3.56	.0012	.0052	.0016	.15	1.0
Nantucket . . .	Wannacomet Pond . . .	.10	8.34	.0028	.0162	.0044	2.45	1.6
NEW BEDFORD . . .	Little Quittacas Pond . . .	.25	4.43	.0019	.0138	.0024	.48	0.7
	Great Quittacas Pond . . .	.38	4.44	.0016	.0145	.0031	.50	0.7
NEWBURYPORT . . .	Artichoke River . . .	.30	7.41	.0050	.0341	.0069	.65	2.6
NORTH ADAMS . . .	Notch Brook Reservoir . . .	.05	7.31	.0025	.0038	.0010	.10	6.1
	Broad Brook . . .	.10	4.63	.0024	.0056	.0012	.12	2.5
	Mount Williams Reservoir . . .	.04	7.32	.0012	.0071	.0021	.09	5.1
NORTHAMPTON . . .	Middle Reservoir . . .	.19	4.65	.0016	.0100	.0034	.17	2.0
	Mountain Street Reservoir . . .	.04	4.08	.0011	.0056	.0015	.12	2.1
North Andover . . .	Great Pond . . .	.21	4.97	.0031	.0104	.0016	.41	1.9
Northborough . . .	Lower Reservoir . . .	.37	4.62	.0018	.0145	.0025	.27	0.9
	Upper Reservoir . . .	.75	5.05	.0035	.0191	.0037	.25	1.1
North Brookfield . . .	Doane Pond . . .	.41	4.20	.0064	.0330	.0115	.20	0.6
	North Pond . . .	.39	4.27	.0045	.0306	.0089	.22	0.6
Northfield . . .	Reservoir . . .	.11	4.60	.0003	.0039	.0008	.14	1.1
Norwood . . .	Buckmaster Pond . . .	.11	4.52	.0055	.0187	.0064	.47	1.5
Orange . . .	Reservoir . . .	.19	4.33	.0007	.0056	-	.20	1.0
Palmer (Fire District No. 1) . . .	Lower Reservoir . . .	.18	3.69	.0008	.0130	.0032	.20	0.7
	Upper Reservoir . . .	.18	3.72	.0013	.0152	.0047	.19	0.6
PEABODY . . .	Spring Pond . . .	.17	6.08	.0087	.0134	.0038	.79	1.9
	Suntaug Lake . . .	.24	5.89	.0098	.0154	.0031	.81	1.9
PITTSFIELD . . .	Ashley Lake . . .	.12	4.70	.0011	.0104	.0020	.13	2.7
	Ashley Brook . . .	.11	5.76	.0018	.0144	.0028	.15	3.5
	Hathaway Brook . . .	.04	7.83	.0005	.0048	.0009	.13	6.6
	Mill Brook . . .	.30	4.64	.0025	.0162	.0042	.12	1.7
	Sackett Brook . . .	.09	6.07	.0013	.0071	.0014	.13	4.4
	Farnham Reservoir . . .	.33	4.93	.0033	.0193	.0041	.12	1.5
Plymouth . . .	Little South Pond . . .	.03	3.19	.0012	.0153	.0028	.65	0.4
	Great South Pond . . .	.02	2.98	.0025	.0139	.0021	.64	0.5
Randolph . . .	Great Pond . . .	.32	5.12	.0029	.0183	.0049	.70	1.3
Rockport . . .	Cape Pond . . .	.39	8.76	.0018	.0214	.0053	2.64	1.5
Russell . . .	Black Brook . . .	.09	4.70	.0007	.0030	.0005	.16	1.4
Rutland . . .	Muschopauge Lake . . .	.06	4.41	.0006	.0082	.0024	.35	1.5
SALEM . . .	Wenham Lake . . .	.30	6.78	.0051	.0168	.0025	.90	2.4
	Longham Reservoir . . .	.83	7.16	.0084	.0231	.0049	1.00	2.1
	Ipswich River at pumping station . . .	1.12	11.66	.0170	.0286	.0108	.83	5.6
Scituate . . .	Inlet of filter . . .	.97	7.13	.0055	.0217	.0027	1.30	1.3
	Outlet of filter . . .	.26	14.00	.0029	.0066	-	1.30	2.1
Shelburne (Shelburne Falls Fire District) . . .	Fox Brook . . .	.14	6.40	.0006	.0044	.0009	.16	3.7
Southbridge . . .	Hatchet Brook Reservoir No. 3 . . .	.14	3.38	.0026	.0134	.0027	.20	0.7
	Hatchet Brook Reservoir No. 4 . . .	.17	3.51	.0039	.0133	.0030	.19	0.6
South Hadley (Fire District No. 1) . . .	Leaping Well Reservoir . . .	.05	3.82	.0019	.0080	.0027	.17	0.9
	Buttery Brook Reservoir . . .	.18	5.03	.0054	.0104	.0033	.39	1.2
Spencer . . .	Shaw Pond . . .	.04	2.80	.0009	.0107	.0015	.20	0.6
SPRINGFIELD . . .	Westfield Little River, filtered . . .	.13	4.06	.0002	.0046	-	.14	1.3
Stockbridge . . .	Lake Averic . . .	.16	7.25	.0028	.0124	.0020	.12	4.3
Stoughton . . .	Muddy Pond Brook . . .	.14	4.38	.0004	.0065	.0015	.34	0.9
TAUNTON . . .	Assawampsett Pond . . .	.24	4.12	.0033	.0152	.0043	.47	0.6
	Elder's Pond . . .	.11	3.83	.0019	.0120	.0019	.47	0.6
Wakefield . . .	Crystal Lake . . .	.18	6.52	.0028	.0197	.0045	.90	2.7
Wareham (Onset) . . .	Jonathan Pond . . .	.04	2.89	.0006	.0083	.0025	.64	0.5
Wayland . . .	Snake Brook Reservoir . . .	.54	4.47	.0015	.0137	.0039	.28	1.5
WESTFIELD . . .	Montgomery Reservoir . . .	.29	3.47	.0077	.0251	.0101	.17	0.5
	Tillotson Brook Reservoir . . .	.05	4.02	.0034	.0038	.0010	.19	0.8
West Springfield . . .	Bear Hole Brook . . .	.09	7.47	.0017	.0041	.0012	.20	4.1
	Bear Hole Brook, filtered . . .	.09	7.30	.0015	.0017	-	.21	4.1
West Stockbridge . . .	East Mountain Reservoir . . .	.00	6.10	.0001	.0014	.0002	.15	3.0
Weymouth . . .	Great Pond . . .	.68	3.89	.0008	.0118	.0018	.46	0.5
Williamsburg . . .	Reservoir . . .	.10	4.53	.0006	.0049	.0013	.19	2.2
Williamstown . . .	Rattlesnake Brook . . .	.05	7.82	.0005	.0051	.0024	.09	6.6
	Paul Brook . . .	.03	5.42	.0011	.0036	.0012	.09	3.5
Winchester . . .	North Reservoir . . .	.06	4.72	.0012	.0095	.0016	.41	1.9
	South Reservoir . . .	.04	4.19	.0015	.0104	.0024	.38	1.7
	Middle Reservoir . . .	.09	3.80	.0028	.0183	.0051	.38	1.7
WORCESTER . . .	Bottomly Reservoir . . .	.35	4.28	.0056	.0161	.0055	.24	1.4
	Kent Reservoir . . .	.21	5.67	.0050	.0107	.0026	.25	1.4
	Leicester Reservoir . . .	.16	3.96	.0034	.0131	.0029	.25	1.2
	Mann Reservoir . . .	.22	3.67	.0011	.0142	.0041	.20	1.3
	Upper Holden Reservoir . . .	.11	2.93	.0044	.0122	.0036	.23	0.9
	Lower Holden Reservoir . . .	.10	3.50	.0027	.0099	.0031	.21	0.9
	Kendall Reservoir . . .	.16	3.48	.0026	.0137	.0045	.20	0.7
	Pine Hill Reservoir . . .	.26	3.99	.0151	.0179	.0049	.25	1.1

Averages of Chemical Analyses of Ground-Water Sources for the Year 1929.

[Parts in 100,000.]

CITY OR TOWN.	SOURCE.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Acton (West and South Water Supply District)	Tubular wells	.00	10.22	.0002	.0010	.61	.1917	.0000	3.7	.006
Adams (Fire District)	Tubular wells	.01	13.60	.0000	.0005	.14	.0350	.0000	6.3	.004
Amesbury	Tubular wells	.20	14.22	.0088	.0023	.49	.0047	.0000	6.2	.478
	Tubular wells, filtered	.06	13.20	.0002	.0017	.50	.0020	.0000	6.7	.018
Ashland	Tubular wells, new supply	.01	5.88	.0005	.0013	.42	.0057	.0000	2.0	.006
ATTLEBORO	Wells	.02	5.31	.0002	.0027	.42	.0065	.0000	2.3	.006
Auburn	Tubular wells	.00	8.33	.0005	.0010	.57	.2100	.0000	3.9	.005
Avon	Wells	.00	7.60	.0000	.0007	.57	.1867	.0000	2.5	.005
Ayer	Large well	.02	8.88	.0002	.0007	1.10	.0565	.0000	3.5	.009
	Tubular wells	.06	7.60	.0003	.0007	.39	.0067	.0000	3.6	.034
Barnstable	Tubular wells	.03	5.25	.0006	.0010	1.16	.0020	.0000	0.5	.016
Bedford	Large well	.00	4.72	.0001	.0013	.45	.0123	.0000	1.6	.008
Belchertown	Tubular wells	.00	6.83	.0001	.0009	.40	.0073	.0000	2.9	.027
Billerica	Wells	.21	8.40	.0025	.0047	.40	.0115	.0000	2.7	.040
Bourne (Monument Beach)	Wells	.03	5.53	.0000	.0010	1.24	.0467	.0002	1.4	.009
Bridgewater	Wells	.00	5.78	.0005	.0010	.61	.1000	.0000	1.4	.008
Brookline	Tubular wells and filter-gallery, filtered	.11	9.43	.0005	.0052	.66	.0153	.0000	3.9	.008
Canton	Springdale well	.03	6.37	.0003	.0017	.50	.0300	.0000	2.0	.004
	Well near Henry's Spring	.01	6.17	.0008	.0014	.53	.0625	.0000	1.9	.009
	Ward well	.01	6.40	.0003	.0016	.54	.0150	.0000	2.1	.005
Chelmsford (North Chelmsford Fire District)	Tubular wells	.14	6.25	.0101	.0052	.45	.0677	.0002	2.1	.018
Chelmsford (Water District)	Tubular wells	.03	8.70	.0000	.0006	.68	.1575	.0007	3.3	.016
Cohasset	Tubular wells	.03	13.69	.0003	.0017	1.83	.1631	.0000	5.1	.006
	Dug well, filtered	.06	7.20	.0010	.0050	1.10	.0020	.0000	4.9	.005
Cummington	Tubular wells	.08	6.33	.0005	.0015	.13	.0020	.0000	3.3	.037
Dedham	Large well and tubular wells	.05	11.13	.0017	.0038	1.02	.1750	.0000	4.3	.010
Deerfield (Fire District)	Wells	.05	5.12	.0001	.0006	.18	.0040	.0000	2.1	.007
Douglas	Tubular wells	.00	6.52	.0003	.0009	.39	.0900	.0000	1.9	.008
Dracont (Water Supply District)	Tubular wells	.07	13.10	.0010	.0019	.77	.1625	.0000	5.4	.057
Dracont (Collinsville)	Tubular wells	.01	5.70	.0002	.0006	.38	.0280	.0000	2.3	.007
Dudley	Tubular wells	.00	3.60	.0005	.0017	.26	.0020	.0000	0.8	.005
Dunstable	Well	.01	5.80	.0000	.0024	.23	.0020	.0000	2.2	.005
Duxbury (Fire and Water District)	Tubular wells	.00	5.07	.0002	.0007	.81	.0047	.0000	0.8	.006
East Brookfield	Tubular wells	.01	3.63	.0002	.0008	.24	.0020	.0000	1.0	.006
Easthampton	Tubular wells	.01	7.67	.0001	.0004	.16	.0200	.0000	4.2	.006
Easton (North Easton Village District)	Well	.00	6.13	.0006	.0010	.51	.0917	.0001	2.4	.008
Edgartown	Large well	.00	4.10	.0002	.0011	.97	.0020	.0000	0.6	.006
Fairhaven	Old wells	.22	8.00	.0006	.0051	1.05	.0950	.0000	2.8	.016
	New wells	.12	6.55	.0028	.0034	1.01	.0605	.0000	2.0	.021
Foxborough (Water Supply District)	Tubular wells	.00	6.40	.0001	.0012	.46	.0700	.0000	1.8	.009
Framingham	Filter-gallery	.05	14.40	.0139	.0060	2.16	.0127	.0011	5.6	.007
Franklin	Tubular wells	.00	5.77	.0000	.0021	.51	.0083	.0000	1.8	.014
Gill	Spring	.01	7.85	.0003	.0024	.25	.0650	.0000	3.3	.010
Grafton	Filter-gallery	.01	11.57	.0001	.0013	1.19	.1925	.0000	3.9	.007
Granville	Well	.02	3.83	.0001	.0005	.11	.0020	.0000	0.9	.008
Great Barrington	Well near Green River	.02	9.56	.0014	.0041	.12	—	—	8.2	.005
	Filter-gallery near Green River	.02	11.53	.0006	.0037	.16	—	—	9.4	.005
Greenfield	Well near Green River	.10	6.67	.0007	.0017	.13	.0020	.0000	3.8	.014
	Large well	.01	6.90	.0007	.0014	.23	.0030	.0000	3.5	.009
Groton										
Groton (West Groton Water Supply District)	Tubular wells	.00	5.58	.0006	.0006	.18	.0025	.0001	3.2	.011
Hardwick (Gilbertville)	Wells	.01	8.33	.0003	.0009	.17	.0025	.0000	3.9	.014
Hardwick (Wheelwright)	Wells	.01	4.77	.0000	.0007	.23	.0090	.0000	0.7	.005
Hingham	Wells	.16	5.67	.0016	.0049	.68	.0132	.0001	1.5	.014
Holliston	Large well	.31	5.32	.0054	.0109	.36	.0025	.0000	1.8	.037
Hopkinton	Tubular wells	.02	10.97	.0003	.0013	.76	.1500	.0000	4.1	.008
Kingston	Tubular wells	.02	5.22	.0002	.0015	.65	.0123	.0000	0.7	.006
Leicester (Water Supply District)	Wells	.04	6.20	.0003	.0021	.31	.0527	.0000	2.9	.008

Averages of Chemical Analyses of Ground-Water Sources, etc. — Continued.

[Parts in 100,000.]

CITY OR TOWN.	SOURCE.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albu- minoid		Nitrates.	Nitrites.		
Leicester (Cherry Valley and Rochdale Water District)	Wells	.17	5.63	.0049	.0107	.31	.0020	.0000	2.3	.008
Littleton	Tubular wells	.01	4.63	.0001	.0011	.22	.0100	.0000	1.8	.006
LOWELL	Boulevard wells (tubular)	.59	7.55	.0422	.0043	.50	.0222	.0004	2.6	.292
	Boulevard wells, filtered	.07	6.66	.0003	.0018	.52	.0346	.0000	2.5	.016
	Wells	.03	10.98	.0001	.0012	1.56	.1333	.0000	3.4	.010
Manchester	Large well	.01	4.84	.0001	.0009	.29	.0079	.0000	1.3	.008
Mansfield (Water Supply District)	Inlet of filter	.18	17.28	.0084	.0086	1.97	.0052	.0001	7.3	.149
Marblehead	Outlet of filter	.08	17.62	.0003	.0052	1.67	.0065	.0000	8.5	.009
	Well	.11	18.05	.0002	.0043	2.23	.0192	.0000	8.5	.015
Marion	Old wells	.00	5.22	.0001	.0007	.63	.0137	.0000	1.3	.004
	New wells	.00	9.50	.0002	.0011	1.39	.0350	.0001	3.1	.005
Marshfield	Tubular wells	.01	7.04	.0002	.0008	.73	.0016	.0001	0.6	.008
	Tubular wells at Humarock Beach	.00	7.05	.0001	.0011	2.05	.0350	.0000	1.8	.006
Mattapoisett	Tubular wells	.01	6.97	.0005	.0004	.80	.0325	.0000	2.3	.009
Medfield	Spring	.02	5.53	.0020	.0033	.30	.0157	.0000	1.4	.006
Medway	Wells	.01	8.37	.0034	.0033	.88	.0483	.0000	2.7	.013
Merrimac	Tubular wells	.03	8.42	.0006	.0009	.57	.0425	.0000	2.8	.019
Methuen	Tubular wells at Harris Brook	.39	6.47	.0044	.0111	.44	.0116	.0000	2.1	.059
	Tubular wells at Pine Island	.00	10.47	.0001	.0011	.88	.1870	.0000	4.5	.005
Middleborough (Fire District)	Well	.25	7.73	.0173	.0038	.62	.0417	.0000	2.4	.332
	Filtered water	.26	7.68	.0057	.0031	.62	.0350	.0004	2.4	.116
Millbury	Well	.04	5.60	.0000	.0011	.33	.0073	.0000	1.9	.005
Millis	Spring	.00	12.87	.0001	.0006	.95	.3333	.0000	5.3	.006
Monson	Old well	.09	3.78	.0002	.0013	.18	.0020	.0000	0.8	.013
	New well	.01	4.02	.0005	.0021	.19	.0027	.0000	0.6	.005
Monterey	Springs	.03	9.70	.0003	.0025	.14	—	—	6.5	.006
Nantucket	Wells at Wyers Valley	.00	5.72	.0001	.0008	1.85	.0027	.0000	1.6	.007
Natick	Large well	.02	11.35	.0001	.0010	1.08	.0075	.0000	5.4	.006
Needham	Old wells and Hicks Spring	.00	8.87	.0003	.0009	.75	.2043	.0000	3.3	.006
	New wells	.01	7.76	.0003	.0012	.71	.1000	.0000	3.2	.006
NEWBURYPORT	Wells and Artichoke River, filtered	.12	6.78	.0003	.0084	.63	.0117	.0000	2.6	.014
NEWTON	Tubular wells and filter-gallery	.02	8.07	.0006	.0018	.67	.0172	.0000	3.5	.012
NORTH ADAMS	Tubular wells	.01	34.07	.0000	.0012	.76	.1866	.0000	17.5	.011
North Attleborough	Wells	.05	7.43	.0001	.0009	.59	.0400	.0000	2.8	.014
Northbridge	Tubular wells	.02	4.17	.0000	.0008	.29	.0035	.0000	0.9	.007
Norton	Tubular wells	.00	4.87	.0001	.0019	.31	.0020	.0000	1.3	.010
Norwood	Tubular wells	.07	8.82	.0009	.0023	.62	.0567	.0000	3.4	.050
Oak Bluffs	Springs	.00	4.60	.0003	.0019	.96	.0073	.0000	0.5	.005
Orange	Crystal Spring	.08	4.63	.0001	.0014	.15	.0020	.0000	1.0	.009
Oxford	Tubular wells	.00	5.92	.0001	.0008	.32	.0300	.0000	2.1	.005
Palmer (Fire District No. 1)	Wells	.00	11.60	.0000	.0004	.67	.2300	.0000	3.7	.006
Palmer (Bondsville)	Tubular wells	.01	7.45	.0000	.0005	.37	.0895	.0012	2.7	.008
Pepperell	Tubular wells	.00	4.50	.0002	.0008	.18	.0030	.0000	1.2	.005
Provincetown	Tubular wells	.01	8.53	.0003	.0009	2.84	.0044	.0000	1.4	.010
Reading	Filter-gallery	1.10	10.28	.0225	.0195	1.19	.0082	.0000	2.3	.363
	Tap in pumping station	.09	14.78	.0122	.0055	1.07	.0020	.0000	5.5	.038
Salisbury	Old well	.14	5.98	.0007	.0039	.56	.0020	.0000	2.9	.021
	New well	.09	9.42	.0002	.0012	.56	.0020	.0000	5.0	.052
Scituate	Webster Meadow wells	.01	10.00	.0002	.0004	1.33	.0543	.0000	3.6	.009
Sharon	Well	.01	20.17	.0009	.0016	3.71	.4250	.0000	9.4	.006
	Tubular wells	.02	5.57	.0004	.0016	.59	.0350	.0001	2.3	.006
Sheffield	Smith Spring	.01	4.30	.0005	.0015	.09	.0020	.0000	1.6	.005
	Clark's Spring	.07	5.80	.0004	.0022	.14	.0035	.0000	3.0	.005
Shirley (Shirley Village Water District)	Well	.00	4.80	.0002	.0007	.42	.1500	.0001	1.5	.005
Shrewsbury	Tubular wells	.03	5.56	.0004	.0022	.33	.0340	.0000	2.1	.026
Somerset	Tubular wells	.01	7.35	.0000	.0010	.51	.0063	.0000	2.2	.006
South Hadley (Fire District No. 2)	Large well	.00	5.40	.0001	.0010	.16	.0140	.0000	1.8	.005
Sunderland	Springs	.05	7.40	.0005	.0013	.16	—	—	4.4	.037
Tisbury	Well	.00	3.70	.0004	.0030	1.07	.0020	.0000	0.5	.030
Uxbridge	Tubular wells	.01	6.77	.0008	.0016	.52	.1333	.0000	2.5	.018

Averages of Chemical Analyses of Ground-Water Sources, etc. — Concluded.

[Parts in 100,000.]

CITY OR TOWN.	Source.	Color.	Residue on Evaporation.	AMMONIA.		Chlorine.	NITROGEN AS —		Hardness.	Iron.
				Free.	Albuminoid.		Nitrates.	Nitrites.		
Walpole	Tubular wells . . . . .	.00	7.00	.0001	.0004	.41	.0500	.0000	1.8	.005
WALTHAM	Old well . . . . .	.14	10.39	.0058	.0022	.79	.0141	.0000	4.3	.117
	New well . . . . .	.01	8.44	.0004	.0016	.57	.0227	.0000	3.7	.020
Ware	Wells . . . . .	.00	9.67	.0005	.0010	.68	.2171	.0001	3.4	.006
	Large well . . . . .	.00	8.97	.0005	.0009	.60	.1886	.0000	3.2	.005
Wareham (Fire District)	Tubular wells . . . . .	.01	3.80	.0002	.0012	.58	.0020	.0000	0.6	.006
Warren	Tubular wells . . . . .	.05	4.20	.0003	.0009	.25	.0200	.0000	1.1	.005
Wayland	Wells . . . . .	.02	7.97	.0001	.0006	.47	.0800	.0000	3.1	.016
Webster	Wells . . . . .	.05	5.88	.0013	.0016	.36	.0240	.0000	2.1	.009
Wellesley	Tubular wells . . . . .	.02	9.37	.0004	.0016	.89	.0353	.0000	3.6	.015
	Well at Williams Spring . . . . .	.01	9.40	.0004	.0043	1.31	.0150	.0000	3.9	.015
	Filter-gallery . . . . .	.01	11.73	.0007	.0024	1.10	.1317	.0000	4.4	.008
Westborough	Filter basin . . . . .	.02	3.48	.0005	.0061	.28	—	—	1.1	.006
West Brookfield	Tubular wells . . . . .	.00	4.27	.0002	.0011	.24	.0047	.0000	1.3	.005
Westford	Tubular wells . . . . .	.00	6.90	.0001	.0006	.22	.0020	.0000	2.6	.015
Weston	Well at Warren Ave. Tubular wells at Kendal Green . . . . .	.14	8.06	.0003	.0045	.58	.0550	.0000	3.7	.015
	Johnson's Spring . . . . .	.08	8.25	.0009	.0025	.84	.0875	.0000	3.4	.007
West Stockbridge	Cold Spring . . . . .	.00	9.95	.0001	.0012	.09	—	—	7.0	.010
Williamstown	Sherman Spring . . . . .	.06	11.80	.0003	.0025	.11	—	—	10.0	.008
	Tubular wells . . . . .	.01	10.25	.0003	.0020	.09	—	—	8.4	.007
Wilmington	Old wells . . . . .	.02	8.01	.0016	.0010	.82	.1320	.0003	2.7	.013
Winchendon	New wells . . . . .	.11	3.93	.0005	.0013	.15	.0020	.0000	0.9	.021
	Filter-gallery . . . . .	.17	3.63	.0006	.0035	.14	.0030	.0000	0.6	.025
WOBURN	Layne well . . . . .	.04	10.16	.0021	.0053	1.09	.0083	.0002	4.4	.009
	Springs . . . . .	.03	13.13	.0049	.0027	1.52	.0337	.0000	5.7	.006
Worthington (Fire District)	Tubular wells . . . . .	.12	3.97	.0003	.0021	.12	.0030	.0001	2.0	.033
Wrentham . . . . .		.00	5.00	.0003	.0020	.33	.0373	.0000	1.6	.005

CONSUMPTION OF WATER.

The quantity of water consumed in various cities and towns in the State where records have been maintained during the year 1929 is shown in the following table. The estimates of population given in the table have been deduced from a comparison of the census records for the years 1920 and 1925. There has been a reduction in the amount of water consumed in some of the municipalities as compared with previous years, this condition being due in some cases, especially in certain textile cities, to industrial depression. On the other hand, the apparently excessive consumption of water in other cities and towns is due in many cases either to the use of large quantities of water for manufacturing purposes or to the fact that the town is a summer resort having a large additional population during the summer season.

Average Daily Consumption of Water in Various Cities and Towns in 1929.

CITY OR TOWN.	Estimated Population.	Gallons.	Gallons per Inhabitant.	CITY OR TOWN.	Estimated Population.	Gallons.	Gallons per Inhabitant.
Metropolitan District	1,379,953	137,044,000	99	Abington and Rockland	14,262	628,000	44
Arlington	29,965	1,864,000	62	Acton	2,567	99,000	39
Belmont	18,861	1,263,000	67	Acushnet	4,983	76,000	15
Boston	804,868	93,832,000	117	Agawam	7,304	313,000	43
Chelsea	50,497	3,611,000	72	Amesbury	12,183	803,000	66
Everett	43,634	5,067,000	116	Amherst	6,310	603,000	96
Lexington	8,933	657,000	74	Andover	11,909	855,000	73
Malden	53,938	3,693,000	68	Ashburnham	2,277	96,000	42
Medford	54,499	3,326,000	61	Athol	9,602	702,000	73
Melrose	21,733	1,502,000	69	Attleboro	21,337	1,200,000	56
Milton	15,645	830,000	53	Avon	2,507	142,000	57
Nahant	1,879	208,000	111	Ayer	3,032	205,000	68
Quincy	69,799	5,597,000	80	Barnstable	6,524	402,000	62
Revere	36,812	2,234,000	61	Bedford	1,636	98,000	60
Somerville	103,784	8,582,000	83	Belchertown	3,581	21,000	6
Stoneham	10,052	667,000	66	Beverly	22,784	1,506,000	66
Swampscott	9,634	738,000	77	Billerica	5,926	322,000	54
Watertown	28,099	2,217,000	77	Braintree	15,283	1,171,000	77
Winthrop	16,721	1,158,000	69	Bridgewater	10,292	208,000	20

*Average Daily Consumption of Water in Various Cities and Towns in 1929 —
Concluded.*

CITY OR TOWN.	Estimated Population.	Gallons.	Gallons per Inhabit- ant.	CITY OR TOWN.	Estimated Population.	Gallons.	Gallons per Inhabit- ant.
BROCKTON	65,343	3,238,000	50	Millis	2,035	125,000	61
Brookfield	1,457	37,000	25	Montague	9,577	872,000	91
Brookline	46,627	4,508,000	97	Nantucket	3,436	561,000	163
CAMBRIDGE	127,649	12,943,000	101	Natick	14,443	756,000	52
Canton	5,896	574,000	97	Needham	10,549	631,000	60
Chelmsford	7,286	192,000	26	NEW BEDFORD	119,539	9,638,000	81
CHICOPEE	46,416	3,081,000	66	NEWBURYPORT	15,687	1,398,000	89
Clinton	15,141	933,000	62	NEWTON	58,563	4,770,000	81
Cohasset	3,132	324,000	103	North Andover	7,299	448,000	61
Concord	7,532	672,000	89	North Attleborough	10,231	622,000	61
Danvers and Middle- ton	14,395	1,436,000	100	Northbridge	10,051	594,000	59
Dartmouth	11,052	137,000	12	North Brookfield	3,394	349,000	103
Dedham	16,419	1,050,000	64	Norton	3,085	147,000	48
Draut	7,520	147,000	20	Norwood	15,371	1,063,000	69
Dudley	5,308	197,000	37	Oak Bluffs	1,527	221,000	145
Duxbury	1,796	148,000	82	Orange	5,141	165,000	32
East Bridgewater	3,580	165,000	46	Oxford	4,191	48,000	11
East Brookfield	968	41,000	42	PEABODY	20,126	3,236,000	161
Easthampton	11,848	840,000	71	Pepperell	3,027	256,000	85
East Longmeadow	3,760	68,000	18	PITTSFIELD	50,969	6,189,000	121
Easton	5,567	231,000	41	Plainville	1,628	116,000	71
Edgartown	1,271	142,000	112	Plymouth	13,280	1,202,000	91
Fairhaven	13,656	497,000	36	Provincetown	3,787	295,000	78
FALL RIVER	135,799	6,254,000	46	Randolph and Hol- brook	9,717	657,000	68
Falmouth	5,649	736,000	130	Reading	9,697	384,000	40
FITCHBURG	45,673	4,036,000	90	Rockport	4,005	323,000	81
Foxborough	5,572	478,000	86	Rutland	2,632	298,000	113
Frammingham	24,314	1,553,000	64	SALEM	43,053	5,316,000	123
Franklin	7,501	533,000	71	Salisbury	1,916	183,000	96
GARDNER	20,137	910,000	45	Saugus	14,239	728,000	51
GLOUCESTER	23,717	1,945,000	82	Scituate	2,857	578,000	202
Grafton	7,042	143,000	20	Sharon	3,639	208,000	57
Great Barrington	6,477	519,000	80	Shelburne	1,620	65,000	40
Greenfield	15,246	1,562,000	102	Shirley	2,502	75,000	30
Groton	2,622	300,000	114	Shrewsbury	7,507	275,000	37
Groveland	2,485	63,000	25	Somerset	5,856	125,000	21
HAVERHILL	49,232	4,350,000	88	Southbridge	16,485	722,000	44
Hingham	6,602	1,150,000	174	SPRINGFIELD	152,025	15,258,000	100
Holliston	2,896	120,000	41	Stockbridge	1,882	221,000	117
HOLYOKE	60,441	7,403,000	122	Stoughton	8,649	566,000	65
Hudson	8,548	393,000	46	TAUNTON	40,951	2,918,000	71
Ipswich	6,055	233,000	38	Tisbury	1,555	258,000	166
Lancaster	2,852	127,000	45	Uxbridge	6,804	277,000	41
LAWRENCE	93,257	4,383,000	47	Wakefield	17,679	734,000	42
Lenox	3,058	300,000	98	Walpole	7,356	1,081,000	147
Lincoln	1,517	242,000	160	WALTHAM	37,810	2,253,000	60
Littleton	1,518	92,000	61	Ware	8,713	353,000	41
Longmeadow	3,905	226,000	58	Wareham	6,538	255,000	39
LOWELL	110,296	5,669,000	51	Wayland	2,511	168,000	67
Ludlow	9,868	214,000	22	Warren	4,338	73,000	17
LYNN	106,227	8,916,000	84	Webster	13,493	615,000	46
Lynnfield	1,463	23,000	16	Wellesley	11,390	846,000	74
Manchester	2,525	322,000	128	West Bridgewater	3,293	138,000	42
Mansfield	6,858	492,000	72	West Brookfield	1,342	47,000	35
Marblehead	8,926	739,000	83	Westfield	19,934	1,896,000	95
Marion	1,271	189,000	149	Westford	3,891	185,000	48
MARLBOROUGH	17,202	686,000	40	Weston	3,406	191,000	56
Mattapoisett	1,779	103,000	58	West Springfield	16,834	2,640,000	157
Maynard	8,474	333,000	39	Weymouth	19,009	1,443,000	76
Medfield	4,085	83,000	20	Whitman	8,425	274,000	33
Medway	3,295	179,000	54	Wilbraham	2,875	42,000	15
Merrimac	2,489	133,000	53	Wilmington	4,263	55,000	13
Methuen	24,939	1,011,000	41	Winchester	12,429	897,000	72
Middleborough	9,684	282,000	29	WOBURN	19,806	1,939,000	98
Millford	19,305	797,000	41	WORCESTER	199,561	17,171,000	86
Millbury	7,072	438,000	62	Wrentham	3,538	130,000	37

RAINFALL.

The following table shows the normal rainfall in the State as deduced from records at eight widely distributed stations with long-term records, also the rainfall for the year 1929, and the excess or deficiency of precipitation in each month as compared with the normal.

MONTH.	Normal Rainfall (Inches).	Rainfall in 1929 (Inches).	Excess or Deficiency in 1929 (Inches).	MONTH.	Normal Rainfall (Inches).	Rainfall in 1929 (Inches).	Excess or Deficiency in 1929 (Inches).
January . . .	3.76	3.83	+0.07	August . . .	4.18	2.96	-1.22
February . . .	3.63	4.00	+0.37	September . . .	3.44	2.52	-0.92
March . . .	3.90	3.52	-0.38	October . . .	3.66	2.95	-0.71
April . . .	3.71	6.99	+3.28	November . . .	3.89	2.93	-0.96
May . . .	3.57	3.94	+0.37	December . . .	3.70	4.11	+0.41
June . . .	3.30	2.51	-0.79				
July . . .	3.74	1.43	-2.31	Totals . . .	44.48	41.69	-2.79

FLOW OF STREAMS.

Sudbury River.

The average yield of the Sudbury River in the year 1929 was 905,000 gallons per day per square mile of drainage area. The normal flow of this river for the 55 years during which records have been maintained is 978,000 gallons per square mile per day. The average daily yield for the six driest months, June to November, inclusive, was 55,000 gallons per square mile, or only 14 per cent of the normal.

The following table shows the relation between the average daily yield of the Sudbury River per square mile in each month in the year 1929 and the normal yield of the river during the past 55 years. The drainage area of the river at the point of measurement is 75.2 square miles.

Table showing the Average Daily Yield of the Sudbury River for Each Month in the Year 1929, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1929.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January . . .	1.744	1.127	2.037	1.317	+ .293	+ .190
February . . .	2.401	1.552	2.337	1.511	- .064	- .041
March . . .	4.137	2.674	4.121	2.664	- .016	- .010
April . . .	3.064	1.980	4.551	2.941	+1.487	+ .961
May . . .	1.722	1.113	2.775	1.793	+1.053	+ .680
June . . .	.792	.512	.353	.228	- .439	- .284
July . . .	.327	.211	- .172	- .111	- .499	- .322
August . . .	.355	.229	- .091	- .059	- .446	- .288
September . . .	.375	.242	- .039	- .025	- .414	- .267
October . . .	.597	.386	.084	.054	- .513	- .332
November . . .	1.190	.769	.393	.254	- .797	- .515
December . . .	1.520	.982	.546	.353	- .974	- .629
Average for whole year . . .	1.514	.978	1.401	.905	- .113	- .073

The rainfall on the Sudbury River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1924 to 1929, inclusive, together with the average for a period of fifty-five years, are given in the following table:

Rainfall, in Inches, received and collected on the Sudbury River Drainage Area.

MONTH.	1924.			1925.			1926.		
	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.
January	3.60	3.205	89.1	4.47	.328	7.4	3.00	1.539	51.2
February	2.56	1.193	46.7	2.20	2.985	136.0	5.92	1.596	27.0
March	2.66	3.462	130.0	5.69	3.895	68.4	3.23	4.863	150.6
April	5.49	5.268	96.1	2.95	2.570	87.2	2.21	3.323	150.5
May	3.22	2.495	77.6	2.45	1.036	42.2	2.29	1.284	56.1
June	1.49	.485	32.5	4.75	.374	7.9	1.60	.179	11.2
July	3.19	-0.094	-2.9	5.35	.427	8.0	3.18	-.122	-3.8
August	4.73	0.207	4.4	1.25	.102	8.2	5.51	.415	7.5
September	5.67	0.705	12.4	3.19	.068	2.1	1.40	-.196	-14.0
October	0.11	0.011	10.0	4.41	.626	14.2	3.77	.203	5.4
November	2.51	0.286	11.4	3.17	1.001	31.6	5.27	1.386	26.3
December	1.73	0.489	28.4	5.76	3.330	57.8	4.03	1.195	29.7
Totals and averages	36.96	17.713	47.9	45.64	16.742	36.7	41.41	15.665	37.8

MONTH.	1927.			1928.			1929.			MEAN FOR FIFTY-FIVE YEARS, 1875-1929.		
	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.	Rain-fall.	Rain-fall col-lected.	Per Cent col-lected.
January	2.91	2.313	79.5	2.69	2.328	86.7	3.99	2.349	58.9	3.96	2.010	50.8
February	3.71	2.355	63.5	3.62	2.746	75.9	3.84	2.434	63.3	4.04	2.522	62.4
March	1.43	3.664	256.6	1.96	2.274	116.3	3.14	4.751	151.5	4.16	4.770	114.7
April	2.24	1.194	53.3	5.44	3.035	55.7	7.30	5.070	69.4	3.68	3.419	92.8
May	2.97	1.369	46.1	2.47	2.523	102.4	3.65	3.199	87.6	3.25	1.985	61.1
June	1.99	.370	18.6	6.36	2.736	43.0	1.65	.394	23.9	3.27	.883	27.0
July	3.82	.232	6.1	5.46	2.170	39.7	0.90	-.198	-21.9	3.68	.377	10.2
August	8.92	1.688	18.9	4.50	.981	21.8	2.14	-.105	-4.9	3.83	.409	10.7
September	3.82	2.260	59.3	3.84	1.026	26.7	2.11	-.043	-2.1	3.36	.418	12.4
October	5.10	2.313	45.3	3.52	.938	26.7	2.85	.097	3.4	3.60	.688	19.1
November	8.21	6.950	84.6	2.16	1.018	47.0	2.97	.439	14.8	3.85	1.328	34.5
December	5.61	4.931	87.8	2.68	1.500	56.0	4.08	.630	15.5	3.80	1.752	46.1
Totals and averages	50.73	29.639	58.4	44.70	23.275	52.1	38.62	19.017	49.2	44.48	20.561	46.2

The following table gives the record of the yield of the Sudbury River watershed in gallons per day per square mile for each of the past six years and the mean for the past fifty-five years:

Yield of the Sudbury River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1924.	1925.	1926.	1927.	1928.	1929.	Mean for Fifty-five Years, 1875-1929.
January	1,796,000	184,000	863,000	1,297,000	1,305,000	1,317,000	1,127,000
February	715,000	1,852,000	991,000	1,462,000	1,645,000	1,511,000	1,552,000
March	1,941,000	2,183,000	2,726,000	2,054,000	1,275,000	2,664,000	2,674,000
April	3,056,000	1,491,000	1,927,000	692,000	1,760,000	2,941,000	1,980,000
May	1,399,000	581,000	720,000	768,000	1,414,000	1,793,000	1,113,000
June	281,000	217,000	104,000	215,000	1,585,000	228,000	512,000
July	-52,000	239,000	-68,000	130,000	1,217,000	-111,000	211,000
August	116,000	57,000	233,000	946,000	550,000	-59,000	229,000
September	408,000	39,000	-113,000	1,307,000	594,000	-25,000	242,000
October	6,000	351,000	114,000	1,297,000	526,000	54,000	386,000
November	166,000	580,000	803,000	4,026,000	589,000	254,000	769,000
December	274,000	1,867,000	670,000	2,764,000	841,000	353,000	982,000
Average for whole year	841,000	797,000	746,000	1,411,000	1,105,000	905,000	978,000
Average for driest six months	152,000	247,000	167,000	676,000	721,000	55,000	390,000

¹ The drainage area of the Sudbury River used in making up these records included water surfaces amounting to about 2 per cent of the whole area from 1875 to 1878, inclusive, subsequently increasing by the construction of storage reservoirs to about 3 per cent in 1879, to 3.5 per cent in 1885, to 4 per cent in 1894, and to 6.5 per cent in 1898. The drainage area also contains extensive areas of swampy land, which, though covered with water at times, are not included in the above percentages of water surfaces.

Nashua River.

The average yield of the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton during the year 1929 was 1,031,000 gallons per day per square mile of drainage area, or about $5\frac{1}{2}$ per cent less than the average for the past 33 years.

The average yield for the six driest months, July to December, inclusive, was 232,000 gallons per day per square mile, or 58 per cent less than the normal.

The following table shows the normal yield of the river by months for the past 33 years, the actual yield in the year 1929, and the excess or deficiency in each month. The drainage area of the Nashua River above the point of measurement was 119 square miles from 1897 to 1907 and 118.19 square miles from 1908 to 1913, inclusive. Since January 1, 1914, the city of Worcester has been diverting water from 9.35 square miles of this drainage area for the supply of that city, leaving the net drainage area 108.84 square miles.

Table showing the Average Daily Yield of the South Branch of the Nashua River for Each Month in the Year 1929, in Cubic Feet per Second per Square Mile of Drainage Area, and in Million Gallons per Day per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	NORMAL YIELD.		ACTUAL YIELD IN 1929.		EXCESS OR DEFICIENCY.	
	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.	Cubic Feet per Second per Square Mile.	Million Gallons per Day per Square Mile.
January	1.815	1.173	1.856	1.200	+ .041	+ .027
February	2.029	1.312	2.218	1.434	+ .189	+ .122
March	3.988	2.578	4.260	2.754	+ .272	+ .176
April	3.427	2.215	4.445	2.873	+1.018	+ .658
May	2.053	1.327	3.341	2.159	+1.288	+ .832
June	1.273	.823	.914	.591	- .359	-.232
July . . . . .	.736	.476	.230	.148	- .506	-.328
August . . . . .	.655	.423	.109	.070	- .546	-.353
September . . . . .	.585	.378	.243	.157	- .342	-.221
October . . . . .	.711	.460	.370	.239	- .341	-.221
November	1.235	.798	.565	.365	- .670	-.433
December	1.782	1.152	.641	.414	-1.141	-.738
Average for whole year	1.689	1.092	1.594	1.031	-.095	-.061

The rainfall on the Nashua River watershed and the total yield expressed in inches in depth upon the watershed (inches of rainfall collected) for each of the past six years, 1924 to 1929, inclusive, together with the average for the past 33 years, are given in the following table:

Rainfall, in Inches, received and collected on the Nashua River Drainage Area.

MONTH.	1924.			1925.			1926.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January	4.23	3.346	79.2	3.68	.563	15.3	2.64	1.695	64.1
February	3.31	1.332	40.3	2.27	2.524	111.3	5.77	1.340	23.2
March	2.41	3.028	125.6	5.81	4.005	69.0	2.92	3.366	115.1
April	6.58	7.262	110.4	3.06	2.482	81.1	2.46	4.165	169.4
May	3.55	3.519	99.0	2.14	1.262	58.8	2.00	1.471	73.6
June	1.13	.775	68.4	3.97	.684	17.2	2.05	.699	34.2
July	2.60	.234	9.0	3.95	.417	10.6	2.93	.461	15.7
August	4.61	.449	9.7	2.04	.347	17.0	2.90	.449	15.5
September	4.79	.552	11.5	4.26	.596	14.0	1.43	.347	24.2
October	0.09	.114	122.5	4.37	.779	17.8	4.69	.691	14.7
November	3.30	.476	14.4	3.43	1.378	40.2	5.32	1.512	28.4
December	2.03	.702	34.6	4.39	2.897	65.9	4.20	1.162	27.7
Totals and averages	38.63	21.789	56.4	43.37	17.934	41.3	39.31	17.358	44.2

*Rainfall, in Inches, received and collected on the Nashua River Drainage Area —
Concluded.*

MONTH.	1927.			1928.			1929.			MEAN FOR THIRTY-THREE YEARS, 1897-1929.		
	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.	Rain-fall.	Rain-fall collected.	Per Cent collected.
January . . .	3.34	2.184	65.5	3.03	2.657	87.7	4.80	2.140	44.5	3.66	2.093	57.1
February . . .	4.63	1.784	38.6	3.92	3.014	77.0	4.28	2.310	54.0	3.87	2.129	55.0
March . . .	1.71	4.167	244.4	2.08	2.291	110.3	3.40	4.912	144.5	3.91	4.598	117.7
April . . .	2.10	1.669	79.7	5.30	3.679	69.4	5.83	4.953	84.9	3.93	3.824	97.2
May . . .	3.04	1.623	53.3	2.92	2.946	100.8	4.62	3.851	83.3	3.32	2.367	71.2
June . . .	2.17	.742	34.2	6.64	3.575	53.8	3.09	1.020	33.0	3.83	1.420	37.1
July . . .	5.94	.997	16.8	4.75	1.627	34.2	.85	.265	31.2	4.07	.849	20.9
August . . .	9.48	2.875	30.3	5.07	1.179	23.2	1.50	.125	8.4	4.04	.755	18.7
September . . .	3.51	2.086	59.4	3.83	1.117	29.1	2.00	.272	13.6	3.58	.652	18.2
October . . .	5.02	1.972	39.2	1.99	.710	35.7	3.12	.427	13.7	3.22	.820	25.5
November . . .	7.50	4.521	60.3	2.40	.776	32.4	3.14	.630	20.1	3.73	1.377	36.9
December . . .	6.23	4.552	73.0	2.08	1.199	57.6	3.30	.739	22.4	3.99	2.055	51.5
Totals and averages	54.67	29.172	53.4	44.01	24.770	56.3	39.93	21.644	54.2	45.15	22.939	50.8

The following table gives the record of the yield of the Nashua River watershed in gallons per day per square mile for each of the past six years and the mean for the past 33 years:

Yield of the Nashua River Drainage Area in Gallons per Day per Square Mile.¹

MONTH.	1924.	1925.	1926.	1927.	1928.	1929.	Mean for Thirty-three Years, 1897-1929.
January . . .	1,876,000	316,000	951,000	1,224,000	1,490,000	1,200,000	1,173,000
February . . .	. . . 798,000	1,566,000	831,000	1,108,000	1,806,000	1,434,000	1,312,000
March . . .	1,697,000	2,245,000	1,887,000	2,336,000	1,284,000	2,754,000	2,578,000
April . . .	4,213,000	1,440,000	2,416,000	968,000	2,134,000	2,873,000	2,215,000
May . . .	1,973,000	708,000	825,000	910,000	1,651,000	2,159,000	1,327,000
June . . .	449,000	396,000	405,000	430,000	2,071,000	591,000	823,000
July . . .	131,000	234,000	258,000	559,000	912,000	148,000	476,000
August . . .	252,000	194,000	252,000	1,612,000	661,000	70,000	423,000
September . . .	320,000	345,000	201,000	1,207,000	646,000	157,000	378,000
October . . .	64,000	437,000	387,000	1,105,000	398,000	239,000	460,000
November . . .	276,000	799,000	876,000	2,619,000	450,000	365,000	798,000
December . . .	394,000	1,624,000	651,000	2,552,000	672,000	414,000	1,152,000
Average for whole year	1,035,000	854,000	826,000	1,389,000	1,176,000	1,031,000	1,092,000
Average for driest six months	239,000	386,000	389,000	949,000	624,000	232,000	558,000

¹ The drainage area used in making up these records included water surfaces amounting to 2.2 per cent of the whole area from 1897 to 1902, inclusive, to 2.4 per cent in 1903, to 3.6 per cent in 1904, to 4.1 per cent in 1905, to 5.1 per cent in 1906, to 6 per cent in 1907, to 7 per cent in 1908, 1909 and 1910, to 6.5 per cent in 1911, to 6.8 per cent in 1912, to 7 per cent in 1913, to 7.4 per cent in 1914 and 1915, to 7.6 per cent in 1916, to 7.4 per cent in 1917 and 1918, to 7.5 per cent in 1919, 1920, 1921 and 1922, to 7.4 per cent in 1923 and 1924, to 6.4 per cent in 1925, to 5.9 per cent in 1926, to 5.7 per cent in 1927, to 7.6 per cent in 1928 and 7.4 per cent in 1929.

Merrimack River.

The Merrimack River is the second in size of the streams of Massachusetts. The river rises in the White Mountains of New Hampshire and flows southerly through the central part of that State until it enters Massachusetts, where it turns to the east and flows in a general northeasterly direction the remainder of its course to the sea. The total length of its watershed from its extreme northerly limits in the mountains of northern New Hampshire to its extreme southerly limits in the hills of Hopkinton, Massachusetts, is about 137 miles and its extreme width about 66 miles. Its total drainage area above its mouth at Newburyport is about 5,000 square miles, of which about one-quarter is within the limits of Massachusetts and the remainder within the State of New Hampshire.

Records of the flow of the Merrimack River have been kept continuously at Lawrence since 1880. The drainage area of the river at that point is 4,663 square

miles, including 118.19 square miles tributary to the South Branch of the Nashua River used for the water supply of the Metropolitan District and in part for the city of Worcester, 75.2 square miles on the Sudbury River, and 18 square miles tributary to Lake Cochituate. The flow as measured at Lawrence includes the water wasted from these drainage areas. In presenting the record of the flow of the river these drainage areas have been deducted, leaving the net drainage area above Lawrence 4,567 square miles in 1880, 4,570 square miles in the years 1891 to 1897, inclusive, and 4,452 square miles since the latter year. The quantity of water overflowing from the Cochituate and Sudbury watersheds as measured by the Metropolitan District Commission has also been deducted from the flow of the river as measured at Lawrence. The average flow of the river during the year 1929 amounted to 1.484 cubic feet per second per square mile, or 959,100 gallons per day per square mile of drainage area, which is about normal for the past 50 years. The flow exceeded the normal in January, February, March, April and May. The greatest deficiency occurred in December.

The following table shows the relation between the normal flow of this stream during the past 50 years and the actual flow during each month of the year 1929.

Table showing the Average Monthly Flow of the Merrimack River at Lawrence for the Year 1929, in Cubic Feet per Second per Square Mile of Drainage Area; also, Departure from the Normal.

MONTH.	Normal Flow, 1880-1929.	Actual Flow in 1929.	Excess or Deficiency.
January	1.268	1.537	+ .269
February	1.353	1.487	+ .134
March	2.757	3.649	+ .892
April	3.513	3.993	+ .480
May	2.267	3.424	+ 1.157
June	1.255	.973	— .282
July	.770	.583	— .187
August	.657	.400	— .257
September	.652	.365	— .287
October	.792	.408	— .384
November	1.137	.499	— .638
December	1.286	.488	— .798
Average for whole year	1.476	1.484	+ .008

The following table gives the record of the flow of the Merrimack River at Lawrence for each of the past six years, together with the average flow for the past 50 years, this amount being expressed in cubic feet per second per square mile of drainage area:

Flow of the Merrimack River at Lawrence in Cubic Feet per Second per Square Mile.

MONTH.	1924.	1925.	1926.	1927.	1928.	1929.	Mean for Fifty Years, 1880-1929.
January	1.964	.357	1.027	.955	2.039	1.537	1.268
February	.978	1.882	.796	1.047	2.069	1.487	1.353
March	1.767	3.413	1.648	3.161	2.048	3.649	2.757
April	5.050	3.102	3.933	1.828	3.437	3.993	3.513
May	3.115	1.349	2.165	1.417	3.160	3.424	2.267
June	.920	.689	.843	.785	2.300	.973	1.255
July	.464	.712	.527	.645	1.636	.583	.770
August	.350	.518	.405	.708	1.550	.400	.657
September	.753	.454	.341	.949	1.500	.365	.652
October	.612	.735	.509	1.355	.977	.408	.792
November	.536	1.067	1.395	3.733	.979	.499	1.137
December	.712	1.577	.872	3.015	1.115	.488	1.286
Average for whole year	1.435	1.321	1.205	1.633	1.901	1.484	1.476
Average for driest six months	.571	.696	.670	.977	1.293	.457	.877

Sudbury, Nashua and Merrimack Rivers.

The following table shows the weekly fluctuations during the year 1929 in the yield of the Sudbury River at Framingham, the South Branch of the Nashua River at the outlet of the Wachusett Reservoir in Clinton, and the Merrimack River at

Lawrence. The flow of these streams, particularly that of the Sudbury River and the South Branch of the Nashua River, serves to indicate the flow of other streams in eastern Massachusetts. The area of the Sudbury River watershed is 75.2 square miles, of the South Branch of the Nashua River 118.19 square miles, and of the Merrimack River at Lawrence 4,452 square miles.

Table Showing the Average Weekly Flow of the Sudbury, South Branch of the Nashua and the Merrimack Rivers for the Year 1929, in Cubic Feet per Second per Square Mile of Drainage Area.

WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.	WEEK ENDING SUNDAY —	Yield of Sudbury River.	Yield of South Branch, Nashua River.	Flow of Merrimack River.
Jan. 6	1.883	1.880	1.236	July 7 . . . .	.599	.258	.782
13	2.358	1.998	1.662	14	— .008	.311	.631
20	2.659	2.490	1.395	21 . . . .	.718	.047	.494
27	3.321	1.339	1.962	28	— .232	.306	.453
Feb. 3	1.992	.972	1.245	Aug. 4 . . . .	.314	.081	.403
10	4.091	4.161	1.741	11 . . . .	.974	.126	.361
17	3.440	1.733	1.729	18 . . . .	.943	.209	.461
24	2.579	1.505	1.287	25 . . . .	.733	.127	.409
Mar. 3	1.208	2.031	1.263	Sept. 1	— .212	.036	.370
10	6.365	5.105	2.470	8 . . . .	.479	.230	.328
17	5.833	6.652	3.440	15 . . . .	.072	.365	.439
24	4.043	3.572	4.966	22	— .251	.176	.418
31	2.627	2.660	4.727	29	1.011	.215	.317
Apr. 7	1.971	2.218	3.293	Oct. 6 . . . .	.605	.680	.369
14	2.663	2.884	3.895	13	1.195	.139	.372
21	7.138	6.834	3.605	20	— .101	.142	.331
28	6.348	5.786	4.912	27 . . . .	.569	.561	.447
May 5	5.588	5.500	5.110	Nov. 3	— .021	.539	.459
12	4.178	3.488	4.286	10 . . . .	.461	.305	.440
19	1.873	2.805	3.074	17	1.287	.615	.378
26	3.446	3.287	2.766	24 . . . .	.800	.896	.771
June 2	3.039	1.167	1.756	Dec. 1	2.138	.244	.479
9	1.141	.619	1.054	8 . . . .	.596	.438	.418
16 . . . .	.438	1.065	.772	15 . . . .	.938	.426	.394
23 . . . .	.083	.876	.897	22 . . . .	.991	.987	.519
30 . . . .	.451	1.213	1.030	29 . . . .	.539	.769	.602

EXAMINATION OF RIVERS.

The deficiency in rainfall and consequent low flow in the streams in the latter half of 1929 reduced very decidedly the quantity of water available for the dilution of the sewage and industrial wastes in streams draining populous districts. On the other hand, depression in some of the manufacturing industries had the effect of reducing the quantity of sewage and manufacturing waste discharged into some of the rivers and streams, tending to improve their condition as compared with previous years.

During the past year the principal rivers of the State have been examined and samples of water have been collected for analysis from the more important streams at approximately the same points as in previous years. In most cases, the examinations of the rivers have been confined to the drier part of the year from June to November, inclusive, but in a number of cases the examinations have been continuous throughout the year.

Aberjona River.

Early in the year 1929 the Attorney-General began an action against certain establishments in Woburn from which polluting wastes were entering the Aberjona River or its tributaries. Following this action work was begun by the city of Woburn in rebuilding the sewer constructed in 1927 for the removal of sewage and wastes which were being discharged into that stream in violation of the provisions of Chapter 291 of the Acts of the year 1911, rebuilding having been found necessary on account of excessive leakage of ground water into this sewer. At the

end of the year this sewer had been reconstructed for a distance of about 3,000 feet, and in consequence of the beginning of this work action against the manufacturers was suspended. Considerable quantities of sewage and objectionable wastes are still being discharged into the Aberjona River contrary to the provisions of the Act of 1911.

In the early part of the year the sewers in Winchester became surcharged owing to lack of adequate carrying capacity in the Metropolitan sewer in that neighborhood and sewage was allowed to discharge from the Winchester sewers temporarily into the Aberjona River under the provisions of Chapter 124 of the Acts of the year 1928. A new Metropolitan sewer has been completed in the Aberjona River valley to the neighborhood of Winchester and has been in operation since September, thus providing an adequate outlet for Winchester sewage.

The results of analyses of samples of water from the river at various points show that it has been polluted very seriously in some portions of its course, but at its entrance to Mystic Lake it has shown somewhat less evidence of pollution than in the previous year.

Samples of water from Upper Mystic Lake also showed an improvement as compared with the previous year when the evidences of pollution were more serious than at any time since 1920.

Assabet River.

At the Grafton State Hospital progress has been made in the removal of the sewage from the watershed of the Assabet River. A slight improvement in the condition of the river has taken place above the Westborough sewage disposal works.

At the Westborough sewage disposal works the reconstruction of certain of the filter beds has been begun. A slight improvement has been noted in the condition of the river below these works.

Below Northborough the condition of the river has deteriorated somewhat as compared with previous years, but the improvement noted last year in the condition of the river below Hudson has been maintained.

A new sewerage system and sewage disposal works were constructed by the town of Maynard and completed during the past year. Very few connections had been made with the system at the end of the year and the disposal works had not yet been put into operation.

At Maynard the river has been in somewhat more objectionable condition than in 1928, while in its course below Maynard there has been an increase in pollution, and the quantity of organic matter in the river at its mouth has been greater than for many years.

Complaints were made to the Department relative to the condition of the Assabet River at Concord during the year, and the Department in previous years has recommended that the heavy industrial wastes discharged into the river from the Massachusetts Reformatory at Concord be removed from the stream. At the end of the year measures were being taken to carry out these recommendations.

Blackstone River.

Kettle Brook, one of the principal tributaries of the Blackstone River in the upper part of its course, has shown more evidence of pollution below Cherry Valley than for many years, a condition due to the discharge of industrial wastes from certain mills along the river in Leicester and Worcester.

Examinations of the Blackstone River below Worcester both above and below the sewage disposal works of the city have shown a slight increase in the pollution of the river as compared with 1928, and there is evidence of a considerable increase also below Millbury, Northbridge, and Uxbridge, while at Millville there has been a slight improvement. The increase in pollution which has taken place at most points along the river as compared with previous years is doubtless due in large part to the low flow of the stream.

Examinations of the river below Worcester and Millbury show the presence of large quantities of tar and oil.

Charles River.

The conditions in the upper portion of this stream, particularly below Milford, still continue to be objectionable as in previous years, but there was a reduction in the pollution of Mine Brook, one of the principal tributaries of the river, below the Franklin sewage filters.

The river also shows marked increase in pollution above and below Medway but little material change has taken place as yet farther down stream.

Special investigations of the river in the lower part of its course were made during the year in connection with the investigations of a special commission with reference to improvements in the Charles River Basin.

Chicopee River.

Examinations of the Chicopee River and its tributaries have shown little if any change in their condition recently as compared with previous years. The river and its tributaries receive considerable pollution at certain points, but at no place have they been seriously objectionable during the past year.

Concord and Sudbury Rivers.

In the upper portion of the Sudbury River watershed an area of some 75 square miles has been used for many years as a source of water supply for the city of Boston and the Metropolitan Water District, and in consequence the flow of the river at the lowest dam of the Metropolitan water works just above Framingham in the drier part of the year is often limited to 1,500,000 gallons per day, the amount which the district is required to discharge into the stream below its lowest dam.

Bannister Brook, one of the tributaries of the Sudbury River which enters the river near Saxonville, receives the effluent from the sewage filter beds of the towns of Natick and Framingham. Ordinarily much untreated or partially treated sewage finds its way into this stream from these disposal works, but during 1929 the effluent from these works has shown considerable improvement.

Below Saxonville the condition of the river has shown little change as compared with previous years.

The Concord River below the junction of its principal tributaries, the Sudbury and Assabet, has shown no material change during the year throughout most of its course, but near its mouth at Lowell its pollution has been more marked than in previous years. There are indications that the population is growing quite rapidly within the watershed of this river, especially in the upper portions of its course, and it is likely to be increasingly difficult as time goes on to maintain the waters of the Sudbury and Assabet rivers in satisfactory sanitary condition.

Connecticut River.

The condition of the Connecticut River as shown by the analyses of its waters above Holyoke remains about the same as in previous years. The Mill River below Northampton and the Manhan River below Easthampton, minor tributaries of the Connecticut River, have shown a marked increase in pollution during 1929. Both streams are badly polluted by domestic sewage and manufacturing waste, the evidence of which has been much more marked than usual in the past year, partly on account of the lower flow in these rivers.

Deerfield River.

The Deerfield River receives very little pollution in any part of its course. A small amount of sewage is discharged into the stream at Shelburne Falls, and considerable pollution enters its tributary, the Green River, and also the Deerfield River at Greenfield near its mouth.

Analyses of the water of the stream show no material change in its condition from previous years at any point.

French River.

The French River is very badly polluted at Webster and Dudley, situated along the boundary line between Massachusetts and Connecticut, by sewage and manu-

facturing waste discharged directly into the stream. The condition of the river was somewhat more objectionable in 1929 than in earlier years. Nevertheless, no further action has been taken in the matter of removing pollution from this river.

Hoosick River.

The Hoosick River is very badly polluted by sewage below Adams, North Adams and Williamstown, and the stream receives, besides, considerable quantities of manufacturing wastes. Its condition is gradually growing worse, and complaint was made during the year of the objectionable condition of this river below North Adams.

Housatonic River.

There has been a considerable increase in the pollution of the Housatonic River at Pittsfield as indicated by the results of chemical analyses of its waters. A large part of this pollution is due to the discharge of untreated and imperfectly treated sewage from the city of Pittsfield.

Farther down stream at Stockbridge the analyses indicate a slight increase in pollution over previous years, and the same is true of the condition of the river below Great Barrington.

Merrimack River.

In response to a resolve of the Legislature a special examination was made of the Merrimack River in the year 1928, the results of which were reported in 1929 in House Document No. 82. Under the provisions of Chapter 202 of the Acts of the year 1929, the Department of Public Health was authorized and directed "to investigate annually until otherwise ordered by the general court, the condition of the Merrimack river and the pollution thereof within the limits of the commonwealth and to determine whether the condition of the stream has changed materially since the last previous investigation thereof at any point within the aforesaid limits." The Department was also directed to report to the General Court the results of its investigations in its annual report.

In accordance with the provisions of the above act, an examination of the river and its tributaries has been made during the year the results of which indicate in general an increase in the pollution of the stream as compared with its condition in the previous year.

The Merrimack River above the point where it enters the State has already received a large amount of direct pollution by sewage and industrial waste chiefly from New Hampshire, but also by industrial waste and sewage from certain cities and towns in Massachusetts situated mostly in the watershed of the Nashua River which enters the Merrimack in New Hampshire above the State line. Very little pollution enters the river in Massachusetts between the State line and the city of Lowell, such pollution as enters the river in this region coming almost wholly through Stony Brook, which joins the river from the south at Chelmsford, a short distance above the dam at Lowell. Numerous analyses of the water at various points along its course, chiefly above and below the cities of Lowell, Lawrence and Haverhill and at points near Amesbury and above Newburyport, in the lower portion of the course of the stream, have shown in general a marked increase in the evidences of pollution at practically all points beginning at the point above Lowell where it enters the State. Some of the minor tributaries which enter the river within the limits of Massachusetts are considerably polluted, especially Cochichewick Brook in North Andover in the water of which the quantity of organic matter present was higher than for several years. The condition of this river as a whole varies more or less from year to year due to the varying amounts of pollution discharged into the stream from sewers and industries along its banks and to variations in the rainfall on its watershed. Its condition on the whole has steadily grown worse from year to year since these observations were begun.

Millers River.

The upper portions of the watershed of the Millers River contain considerable concentrations of population in the city of Gardner and in the town of Winchendon, but both of these municipalities are now provided with systems of sewage

disposal. The river however is considerably polluted below Gardner, due largely to the imperfect purification of the sewage at the Gardner sewage disposal works. There has been an improvement in the branch of the river below Winchendon due to the treatment of the sewage from a portion of the town at new sewage disposal works which have been in continuous operation during the year.

Farther down stream at South Royalston the evidences of pollution have greatly diminished and the condition of the river water was better than for several years.

Below South Royalston the river receives considerable additional pollution from sewage and manufacturing waste at Athol and Orange, though its condition is not objectionable at any point.

Nashua River.

The Nashua River above the effluent from the Fitchburg sewage disposal plant during the past year has been very badly polluted and its condition most objectionable.

Farther down stream at North Leominster its condition still shows evidence of gross pollution.

At Leominster most of the sewage of the city is discharged into Monoosnock Brook near its confluence with the river, and that stream is practically an open sewer.

Below Leominster the conditions are still objectionable and at its confluence with the South Branch at Lancaster the river contained more putrescible organic matter than for many years.

The South Branch of the Nashua River above the point of entrance of the effluent from the Clinton sewage disposal works is badly polluted, though its condition has been slightly less objectionable than in previous years. Below the entrance of the effluent from the Clinton sewage disposal works the condition of the stream has changed but little in the last few years and still shows evidence of much pollution.

The main river is still very badly polluted for a considerable distance below Lancaster, notwithstanding the dilution which it receives, and throughout the remainder of its course in the State its condition has shown no improvement as compared with previous years.

Plans were prepared during the year by the city of Leominster for the construction of works for the treatment of the sewage of that city.

Complaints have been made to this Department relating to the condition of the Nashua River at several points on its course during the past year.

Neponset River.

Following special legislation enacted in 1902 and amended in 1906 prohibiting the entrance or discharge of sewage or manufacturing waste into the Neponset River under heavy penalties, towns and industries spent large sums of money in the aggregate in diverting the sewage and manufacturing wastes from the river and its tributaries or in treating them for the removal of objectionable properties, and in consequence of this effort a considerable improvement was effected in the condition of the river for several years. With the growth of population and industry, however, it became obvious that, notwithstanding these efforts, it was impracticable to keep this stream in a reasonably satisfactory condition. As a result of an investigation by this Department in 1926, in response to an order of the Legislature, the results of which were presented to the Legislature in House Document 212 of the year 1927, an act was passed in 1928 (Chapter 384) admitting the towns of Canton, Stoughton, Norwood and Walpole in the valley of this river into the Metropolitan Sewerage District and providing for the construction of a sewer for the removal of sewage and manufacturing waste from these municipalities into the South Metropolitan sewerage system. The main sewer is now being constructed in this valley to receive the sewage of the towns and the manufacturing wastes from the various industries which are now discharged into the river or its tributaries. The river continues to be very badly polluted throughout most of its course and has been more objectionable than in any recent year.

North River in Salem and Peabody.

By the completion of a general sewerage system for the South Essex Sewerage District, including the cities of Salem and Peabody, it has become practicable to remove the sewage of these cities, together with that of the city of Beverly, the town of Danvers and of certain public institutions, to an outlet into Salem harbor. This system when completed should afford an adequate means of relief for the objectionable pollution of the North River which has been a source of serious complaint for many years.

Taunton River.

The Taunton River and its tributaries show somewhat more marked evidence of pollution in the upper waters than in other recent years, and there is a slight evidence of an increase of pollution in the main stream at Berkeley Bridge.

Ten Mile River.

The condition of this river as shown by the analyses during the past year has remained about the same as in recent years. The river is very badly polluted by imperfectly purified sewage from North Attleborough.

EXAMINATION OF SEWAGE DISPOSAL WORKS.

At Attleboro the sewage has been well distributed over the entire area of filter beds, and the results of the operation of these works have been satisfactory during the year. The accumulation of sludge on the filter beds has increased considerably, and if this increase continues it will probably be necessary to provide a settling tank for the preliminary treatment of the sewage.

At Brockton the greater part of the sewage has been applied first to the trickling filter and subsequently passed through sand filters. A larger area of secondary sand filters has been in use during the past year than previously, and the results in the treatment of the sewage have been more satisfactory.

At Clinton the quantity of sewage pumped to the disposal works has been less than in recent years. The filter beds which are not capable of treating all the sewage have given less satisfactory results than heretofore. Considerable quantities of sewage have overflowed into the south branch of the Nashua River, both at the pumping station without treatment and at the disposal works after sedimentation. Extensive improvements are necessary at these works.

A considerable portion of the sewerage system at West Concord has been completed, and many additional house connections have been made. The results of the operation of the filter beds at Concord have been satisfactory.

At Easthampton the sewage of the town is passed through settling tanks, but less than one-half of it is filtered through the sand filter beds, the larger portion being discharged directly into the Manhan River without further treatment. The filter beds are not adequate for the disposal of the entire quantity of sewage of the town, and there has been an increase in the pollution of the Manhan River due to the overflow of this untreated sewage.

The sewage disposal works at Fitchburg have been operated throughout the year with the usual care, and the results obtained have been satisfactory.

At Framingham the plant as a whole has been operated satisfactorily. It is important that some means of measuring and recording the quantity of sewage be installed at these works. Examinations of the filtering material in some of the new filter beds were made a year ago, and during the past year two of the beds were reconstructed and large quantities of inferior material removed. Less sewage has overflowed from this plant into Bannister Brook than in previous years.

At Franklin the sewage is not properly distributed over the entire area of the filters as has been the case in previous years, and the effluent discharged from the underdrains has shown deterioration in quality. More care is necessary in the operation of the works, particularly in the matter of distributing the sewage more evenly over the whole area.

The condition of the sewage disposal works at Gardner has remained about the same as in recent years. The area of filter beds at the Templeton area is inadequate.

quate for the proper disposal of the sewage, and especially at times of heavy storms considerable sewage overflows into a brook which is tributary to Otter River. Additional filter beds should be constructed as soon as possible. An efficient method of measuring and recording the quantity of sewage discharged to these disposal works should be provided.

The sewage filters at Leicester, which were recently rebuilt and enlarged, have been in satisfactory condition during the year and have shown more efficiency than in previous years. Further additions may soon be necessary.

The disposal works at Milford have received more attention than in recent years, and there has been an improvement in the operation of the Imhoff and trickling filter plant. The character of the effluent of the sand filters also shows a slight improvement over that of last year.

At Natick the efficiency of the filtration area is still unsatisfactory, and the works are inadequate for the proper treatment of all of the sewage of the town. The dry season in the past year has resulted in a smaller overflow of untreated sewage to Bannister Brook. A better distribution of the sewage over the entire area of filters and an additional area of filters are needed.

At North Attleborough the operation of the filter beds has continued to be unsatisfactory as was the case in 1928. The area of the filters is inadequate to care for all of the sewage and large quantities are discharged into a swamp below the sewage disposal works. The reconstruction of the present filters and the construction of additional filters should be begun without further delay.

Since the reconstruction of the filter beds at Northbridge two years ago and the removal of the poor material, the filters have shown more satisfactory results.

At Norwood the filter beds are still inadequate for the proper treatment of the sewage of the town, and considerable quantities of sewage have overflowed to areas outside the filter beds. With the completion of the extension of the South Metropolitan sewer in the Neponset River valley the further operation of these filter beds will be unnecessary.

The disposal works at Pittsfield have become inadequate for the effective treatment of the quantity of sewage now discharged from the city, and in consequence much of the sewage is discharged into the Housatonic River without treatment. Steps should be taken at the earliest possible time toward the enlargement and improvement of the disposal works of this city.

At Southbridge the area of the filter beds is still inadequate for the proper treatment of all the sewage of the town. At times of storm, large quantities of sewage are discharged untreated into the Quinebaug River.

At Westborough the sewage disposal works have been badly overtaxed during the year. The town began the reconstruction of three of the filter beds late in the year in the course of which the unsatisfactory filtering material is being removed and is to be replaced with material more suitable for the purpose.

The new disposal works at Winchendon which were put into operation late in 1928 have been operated during the past year, and the results obtained have been satisfactory.

At Worcester the new sewage disposal works consisting of Imhoff tanks, trickling filters and secondary tanks show a marked improvement in the effective treatment of the sewage as compared with the early years of operation.

The results of the operation of the other larger municipal sewage disposal works have been about the same as in previous years.

The results of the analyses of sewage and effluent, together with statistics concerning the more important sewage disposal works, are presented in the following tables:

TABLE No. 1. — *Average Results of the Analyses of Monthly Samples of Sewage as received at Disposal Works.* (Fals determined in about 64 Per Cent of the Samples.)
[Parts in 100,000.]

CITY OR TOWN.	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.		OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.			Unfil-tered.	Fil-tered.	Unfil-tered.	Fil-tered.				
	Total.	Dis-solved.	Sus-pended.	Total.	Dis-solved.	Sus-pended.												
ATTLEBORO ¹	38.30	32.26	6.04	17.14	12.33	4.81	2.61	.41	.27	.14	3.47	2.80	.202	.092	.95	—	—	
BROCKTON ²	49.75	31.49	18.26	28.13	12.47	15.66	4.50	.71	.38	.33	5.37	6.04	.122	.049	1.45	6.93	—	
CLINTON ¹	127.95	78.95	49.00	67.58	35.80	31.78	4.28	1.43	.90	.53	6.23	13.34	.209	.082	3.17	24.66	—	
CONCORD ¹	27.73	21.60	6.13	15.03	10.40	4.63	2.03	.58	.19	.39	2.61	3.00	.077	.042	.92	—	—	
EASTHAMPTON ¹	56.44	40.16	16.28	32.80	18.04	14.76	4.07	.77	.46	.31	5.01	5.58	.108	.046	1.50	—	—	
FITCHBURG	39.16	29.90	9.26	19.18	13.44	5.74	2.14	.47	.32	.15	3.55	4.60	.274	.103	.95	6.33	—	
Frammingham (Imhoff) ³	73.43	50.15	23.28	37.06	21.20	15.86	4.53	.83	.56	.27	6.48	6.43	.199	.077	1.88	8.65	—	
Frammingham ²	106.62	59.55	47.07	64.94	27.90	37.04	3.61	1.34	.90	.44	6.48	14.60	.280	.104	2.74	14.29	—	
Franklin ¹	24.17	20.00	4.17	10.27	7.17	3.10	1.61	.24	.14	.10	2.72	2.19	.055	.025	.62	—	—	
GARDNER (Gardner Area) ⁴	80.85	52.55	28.30	51.55	28.00	23.55	6.30	1.20	.82	.38	6.15	8.90	.160	.059	2.62	14.12	—	
GARDNER (Templeton Area)	68.58	47.48	21.10	38.92	21.35	17.57	7.68	1.25	.75	.50	7.26	7.32	.129	.055	2.48	9.74	—	
Hopedale ²	58.60	37.20	21.40	33.30	17.53	15.77	7.19	1.00	.62	.38	4.53	7.23	.124	.041	2.11	—	—	
Hudson ¹	63.50	40.97	22.53	36.10	19.90	16.20	7.63	1.11	.65	.46	5.65	7.03	.116	.047	2.23	9.38	—	
Leicester ⁴	35.76	26.84	8.92	18.36	11.52	6.84	2.78	.52	.30	.22	2.99	3.97	.060	.030	1.03	—	—	
Marion ¹	33.36	23.93	9.43	19.03	11.46	7.57	1.80	.35	.24	.11	3.37	3.12	.072	.042	.84	—	—	
MARLBOROUGH	71.90	45.87	26.03	44.37	21.97	22.0	3.80	.92	.55	.37	5.90	7.06	.139	.058	1.78	12.47	—	
Milford	44.40	33.14	11.26	22.78	13.27	9.51	4.73	.72	.45	.27	4.86	4.62	.094	.052	1.45	—	—	
Nauck ¹	47.04	33.93	13.11	21.06	11.46	9.60	3.05	.50	.29	.21	5.55	4.20	.142	.051	1.06	5.00	—	
North Attleborough ¹	32.70	27.20	5.50	14.63	9.87	4.76	1.52	.39	.25	.14	3.70	3.27	.078	.043	.94	—	—	
Northbridge	44.57	28.80	15.77	23.93	12.95	10.98	4.68	.81	.52	.29	3.25	5.22	.092	.039	1.59	—	—	
Norwood	75.55	54.87	20.68	36.30	22.35	13.95	3.83	.66	.38	.28	11.13	9.27	.214	.028	1.77	7.75	—	
Pittsfield ²	49.60	42.07	7.53	24.27	18.78	5.49	2.72	.52	.37	.15	6.23	6.06	.089	.042	1.08	5.81	—	
Southbridge ¹	68.37	46.83	21.54	39.00	22.23	16.77	5.52	1.29	.88	.41	7.17	7.47	.215	.049	2.62	7.51	—	
Spencer ¹	274.88	60.92	213.96	219.76	39.56	180.20	3.74	4.63	1.47	3.16	3.89	26.72	.874	.176	11.42	60.77	—	
Stockbridge ⁴	30.30	25.05	5.25	15.40	11.10	4.30	2.76	.29	.23	.06	2.86	2.70	.038	.022	.60	—	—	
Westborough	58.42	41.80	16.62	34.35	20.44	13.91	4.25	.81	.54	.27	11.88	7.12	.121	.059	1.74	10.08	—	
Winchendon ⁴	39.30	25.85	13.45	20.35	11.05	9.30	3.33	.51	.30	.21	3.72	1.91	.412	.180	1.12	—	—	
WORCESTER	115.88	76.88	39.00	43.38	21.56	21.82	2.36	.63	.23	.40	9.95	8.59	8.270	3.240	1.77	8.76	—	

¹ Six samples.² At pumping station.³ Entrance to Imhoff tanks, including Saxonville sewage.⁴ Four samples.

TABLE No. 2. — *Average Results of the Analyses of Monthly Samples of Sewage as Applied to Filter Beds after Preliminary Treatment as Indicated. (Fats determined in about 6/4 Per Cent of the Samples.)*
 [Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	RESIDUE ON EVAPORATION.						AMMONIA.				OXYGEN CONSUMED.		IRON.		Kjeldahl Nitrogen.	Fats.
		TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.			Unfiltered.	Filtered.	Unfiltered.	Filtered.		
		Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.		Total.	Dissolved.	Suspended.						
ATTLEBORO ¹	None	38.30	32.26	6.04	17.14	12.33	4.81	2.61	.41	.27	.14	3.47	1.80	.202	.092	.95	—
BROCKTON	Tanks	40.50	33.06	7.44	19.16	13.71	5.45	3.84	.45	.28	.17	5.83	2.81	.107	.059	1.01	3.80
Clinton	Basins	60.93	53.67	7.26	29.53	24.18	5.35	2.85	.66	.45	.21	4.86	4.57	.118	.089	1.36	10.11
Concord ¹	None	27.73	21.60	6.13	15.03	10.40	4.63	2.03	.58	.19	.39	2.61	3.00	.077	.042	.92	—
Easthampton	Tanks	48.08	37.48	10.60	26.04	17.28	8.76	4.12	.60	.40	.20	4.60	4.55	.095	.029	1.12	—
FITCHBURG	Imhoff	29.52	25.42	4.10	12.60	10.34	2.26	2.20	.29	.23	.06	3.57	2.18	.197	.105	.64	2.88
Frammingham	Imhoff	51.67	43.00	8.67	22.28	16.72	5.56	4.87	.60	.43	.17	6.14	3.69	.136	.083	1.17	5.06
Franklin	Tanks	27.00	24.37	2.63	11.30	9.50	1.80	2.54	.25	.19	.06	3.52	1.50	.058	.029	.61	—
GARDNER (Gardner Area)	None	80.85	52.55	28.30	51.55	28.00	23.55	6.30	1.20	.82	.38	6.15	8.90	.160	.059	2.62	14.12
GARDNER (Templeton Area)	Tanks	41.10	33.80	7.30	19.78	14.43	5.35	5.42	.54	.35	.19	5.03	4.66	.119	.062	1.10	4.47
Hopedale ¹	Tanks	37.30	31.43	5.87	18.40	13.87	4.53	4.85	.41	.28	.13	4.04	2.49	.129	.062	1.10	—
Hudson	Tanks	44.32	35.73	8.69	22.29	15.56	6.73	5.15	.60	.41	.19	4.95	2.80	.104	.053	1.27	4.26
Leicester ²	None	35.76	26.84	8.92	18.36	11.52	6.84	2.78	.52	.30	.22	2.99	3.97	.060	.030	1.03	—
Marion ¹	None	33.36	23.93	9.43	19.03	11.46	7.57	1.80	.35	.24	.11	3.37	3.12	.072	.042	.84	—
MALBOROUGH	Tanks	54.55	45.05	9.50	28.00	20.43	7.57	4.47	.62	.46	.16	6.27	5.84	.120	.069	1.36	7.20
Milford	Tanks	44.73	39.53	5.20	20.33	16.29	4.04	4.50	.41	.28	.13	5.84	2.68	.101	.055	.91	—
Milford	Imhoff	34.71	30.55	4.16	14.90	11.89	3.01	3.10	.33	.23	.10	4.79	2.30	.077	.042	.68	—
Natick	None	47.04	33.93	13.11	21.06	11.46	9.60	3.05	.50	.29	.21	5.55	4.20	.142	.051	1.06	5.00
North Attleborough ¹	Tanks	26.53	24.00	2.53	11.00	9.27	1.73	2.17	.28	.21	.07	2.79	2.50	.076	.036	.66	—
Northbridge	Tanks	23.32	19.67	3.65	11.32	8.50	2.82	2.81	.31	.22	.09	2.59	2.13	.068	.045	.68	—
Norwood	Tanks	80.08	52.13	27.95	39.53	20.32	19.21	3.48	.59	.35	.24	11.47	8.12	.139	.062	1.60	8.22
Pittsfield	None	49.60	42.07	7.53	24.27	18.78	5.49	2.72	.52	.37	.15	5.14	6.23	.089	.042	1.08	5.81
Southbridge ¹	Tanks	41.80	32.96	8.84	21.07	15.96	5.11	4.66	.65	.36	.29	4.00	4.88	.149	.069	1.13	4.89
Spencer ¹	None	274.88	60.92	213.96	39.56	180.20	3.74	4.63	1.47	.81	.36	3.89	26.72	.874	.176	11.42	60.77
Stockbridge ²	None	30.30	25.05	5.25	15.40	11.10	4.30	2.76	.29	.23	.06	2.06	2.70	.038	.022	.60	—
Westborough	None	58.42	41.80	16.62	34.35	20.44	13.91	4.25	.81	.54	.27	11.88	7.12	.121	.059	1.74	10.08
Winchendon ²	Tanks	31.00	29.45	1.55	13.50	12.35	1.15	2.88	.29	.24	.05	2.72	1.96	.259	.160	.71	—
WORCESTER	Imhoff	75.76	55.20	20.56	19.68	9.56	10.12	2.90	.33	.15	.18	10.48	5.76	4.048	.394	.95	3.70

¹ Six samples.

² Four samples.

TABLE NO. 3. — *Efficiency of Settling Tanks and Other Forms of Preliminary Treatment as Indicated by the Foregoing Tables.*
 [Parts in 100,000.]

CITY OR TOWN.	Form of Preliminary Treatment.	SUSPENDED SOLIDS.			TOTAL ALBUMINOID AMMONIA.			OXYGEN CONSUMED.			FATS. ¹		CHLORINE.	
		Raw Sewage.	Settled or treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or treated Sewage.	Per Cent removed.	Raw Sewage.	Settled or treated Sewage.	Raw Sewage.	Settled or treated Sewage.
BROCKTON	Tanks	18.26	7.44	65	.71	.45	22	6.04	4.43	27	6.93	3.80	5.37	5.83
Clinton	Basins	49.00	7.26	85	.90	.66	27	13.34	5.76	57	24.66	10.11	6.23	4.86
Easthampton	Tanks	16.28	10.60	35	.77	.60	22	5.58	4.95	11	—	—	5.01	4.60
Fitchburg	Imhoff	9.26	4.10	56	.47	.29	38	4.60	2.95	36	6.33	2.88	3.55	3.57
Frammingham ²	Imhoff	23.28	8.67	63	.83	.60	28	6.43	5.06	21	8.65	5.06	6.48	6.14
Franklin	Tanks	4.17	2.63	37	.24	.25	—	2.19	2.48	—	—	—	2.72	2.52
GARDNER (Templeton Area)	Tanks	21.10	7.30	65	1.25	.54	57	7.32	4.66	36	9.74	4.47	7.26	5.03
Hopedale	Tanks	21.40	5.87	73	1.00	.41	59	7.23	5.37	26	—	—	4.53	4.04
Hudson	Tanks	22.53	8.69	61	1.11	.60	46	7.03	4.28	39	9.38	4.26	5.65	4.29
MARLBOROUGH	Tanks	26.03	9.50	64	.92	.62	33	7.06	5.84	17	12.47	7.20	5.90	6.27
Milford	Tanks	11.26	5.20	54	.72	.41	43	4.62	3.86	16	—	—	4.86	5.84
Millis	Imhoff	11.26	4.16	63	.72	.33	54	4.62	2.30	50	—	—	4.86	4.79
North Attleborough	Tanks	5.50	2.53	54	.39	.28	28	3.27	2.50	24	—	—	3.70	2.79
Northbridge	Tanks	15.77	3.65	77	.81	.31	62	5.22	2.96	43	—	—	3.25	2.59
Norwood	Tank	20.68	27.95	—	.66	.59	11	9.27	8.12	12	7.75	8.22	11.13	11.47
Southbridge	Tanks	21.54	8.84	59	1.29	.65	50	7.47	4.88	35	7.51	4.89	7.17	4.00
Winchendon	Tanks	13.45	1.55	89	.51	.29	43	3.47	2.72	22	—	—	3.72	4.45
WORCESTER	Imhoff	39.00	20.56	47	.63	.33	48	8.50	5.76	33	8.76	3.70	9.95	10.48

¹ Fats determined in about 64 per cent of samples.

² The analyses of the comparatively small quantity of sewage from Saxonville not used in determining the efficiency of these tanks.

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester and of their Effluents, etc., Per Cent Removed, etc.*
 [Parts in 100,000.]
Brockton.

	RESIDUE ON EVAPORATION.						AMMONIA.				NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.	
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.			Nitrates.	Nitrites.	Unfiltered.	Filtered.				
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.		Total.	Dissolved.	Suspended.								
Settled sewage as applied to trickling filter.	40.50	33.06	7.44	19.16	13.71	5.45	3.84	.45	.28	.17	5.83	—	4.43	2.81	1.01	3.80	Trickling filter has an area of 2.0 acres and a depth of 10 feet of stone from 1.5 to 3 inches in size.	
Effluent from trickling filter.	44.25	38.40	5.85	18.92	13.90	5.02	1.86	.32	.15	.17	6.73	2.4440	.0130	3.56	2.14	.70	1.35	One half of filter used alternately. The average rate of operation was about 1,262,000 gallons per acre per day.
Per cent removed by Settled effluent from trickling filter.	—	—	21	1	—	8	52	29	46	0	—	—	20	24	31	64	Period of sedimentation averaged about 1.73 hours.	
	43.32	38.30	5.02	16.60	13.30	3.30	1.91	.24	.14	.10	7.57	2.1652	.0134	3.13	1.92	.61	1.29	
Per cent removed by secondary settling tank.	4	—	14	12	4	34	—	25	7	41	—	—	12	10	13	4	40	Tanks cleaned 52 times.
Per cent removed by trickling filter and secondary settling tank.	—	—	33	13	3	39	50	47	50	41	—	—	29	32	40	40	40	

TABLE No. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester, and of their Effluents, etc., Per Cent Removed, etc.* — Continued.

[Parts in 100,000.]

Fitchburg.

	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.	NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.				Nitrates.	Nitrites.	Unfiltered.	Filtered.			
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.												
Inhoff tank effluent as applied to trickling filter.	29.52	25.42	4.10	12.60	10.31	2.26	2.20	.29	.23	.06	3.57	—	2.95	2.18	.64	2.88	Trickling filter has an area of 2.14 acres and a depth of 10 feet of stone from 1 to 3 inches in size. The average rate of operation was about 1,591,000 gallons per acre per day for area used (1.86 acres).	
Effluent from trickling filter.	31.16	26.31	4.85	12.60	10.75	1.85	.70	.13	.07	.06	3.53	.0401	1.59	1.12	.36	—		
Per cent removed .	—	—	—	0	—	18	68	55	70	0	1	—	46	49	44	—		
Settled effluent from trickling filter as discharged to Nashua River.	28.44	25.50	2.94	11.76	9.88	1.88	.79	.13	.08	.05	3.43	.0442	1.73	1.14	.39	—		
Per cent removed by secondary settling tanks.	9	3	39	7	8	—	—	0	—	17	3	—	—	—	—	—	Period of sedimentation about 7½ hours.	
Per cent removed by trickling filter and secondary settling tank.	4	—	28	7	4	17	64	55	65	2	4	—	41	48	39	—	Tanks cleaned 3 times.	

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester and of their Effluents, etc., Per Cent Removed, etc. — Continued.*

[Parts in 100,000.]

Milford.

	RESIDUE ON EVAPORATION.						AMMONIA.				Chlorine.	NITROGEN AS —		OXYGEN CONSUMED.		Kjeldahl Nitrogen.	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.				Nitrates.	Nitrites.	Unfiltered.	Filtered.			
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.												
Imhoff tank effluent as applied to trickling filter.	34.71	30.55	4.16	14.90	11.89	3.01	3.10	.33	.23	.10	4.79	.1767	.0156	2.30	1.50	.68	—	Trickling filter has an area of .28 of an acre and a depth of 6 feet of stone 1 to 1½ inches in size.
Effluent from trickling filter.	36.78	33.93	2.85	14.05	12.53	1.52	.78	.19	.10	.09	4.62	1.6630	.1033	1.76	1.03	.42	—	
Per cent removed	—	—	31	6	—	50	75	42	57	10	4	—	—	23	31	38	—	
Settled effluent from trickling filter as discharged to Charles River.	37.11	35.16	1.95	14.64	12.94	1.70	.96	.15	.09	.06	5.02	2.1899	.0143	1.28	.89	.38	—	
Per cent removed by secondary settling tank.	—	—	32	—	—	—	—	21	10	33	—	—	—	27	14	10	—	
Per cent removed by trickling filter and secondary settling tank.	—	—	53	2	—	44	69	55	61	40	—	—	—	44	41	44	—	

TABLE NO. 4. — *Average Results of the Analyses of Monthly Samples of Sewage applied to the Trickling Filters at Brockton, Fitchburg, Milford and Worcester and of their Effluents, etc., Per Cent Removed, etc. — Concluded.*

[Parts in 100,000.]

Worcester.

	RESIDUE ON EVAPORATION.						AMMONIA.				NITROGEN AS —		OXYGEN CONSUMED.		Nitrogen Kjeldahl	Fats.	REMARKS.
	TOTAL RESIDUE.			LOSS ON IGNITION.			Free.	ALBUMINOID.									
	Total.	Dissolved.	Suspended.	Total.	Dissolved.	Suspended.											
								Total.	Dissolved.	Suspended.							
Imhoff tank effluent as applied to trickling filters.	75.76	55.20	20.56	19.68	9.56	10.12	2.90	.33	.15	.18	10.48	5.76	2.48	.95	3.70	Trickling filters have an area of 13.68 acres and a depth of 10 feet of stone from 1¼ to 3 inches in size.	
Effluent from trickling filters.	67.12	51.32	15.80	15.06	8.20	6.86	1.63	.22	.08	.14	10.35	2.79	1.27	.56	—	The average rate of operation was about 1,520,000 gallons per acre per day.	
Per cent removed by settling filters as discharged to Blackstone River.	11	7	23	23	14	32	44	33	47	22	12	52	49	41	—	—	
Per cent removed by secondary settling tanks.	64.94	52.60	12.34	13.74	8.52	5.22	1.39	.12	.06	.06	10.29	2.09	1.05	.36	—	—	
Per cent removed by trickling filters and secondary settling tanks.	3	—	22	9	—	24	15	45	25	57	—	25	17	36	—	Period of sedimentation averaged about 2.1 hours.	
	14	5	40	30	11	48	52	64	60	67	2	64	58	62	—	Tanks cleaned 12 times.	

Trickling filters have an area of 13.68 acres and a depth of 10 feet of stone from 1¼ to 3 inches in size. The average rate of operation was about 1,320,000 gallons per acre per day.

Period of sedimentation averaged about 2.1 hours. Tanks cleaned 12 times.

TABLE NO. 5. — *Average Results of Analyses of Monthly Samples of Effluent from Sand Filters.*

[Parts in 100,000.]

CITY OR TOWN.	Free Ammonia.	Total Albuminoid Ammonia.	Chlorine.	NITROGEN AS —		Iron.
				Nitrates.	Nitrites.	
ATTLEBORO ¹	.72	.0738	3.80	1.50 0	.0166	.051
BROCKTON ²	1.19	.0600	7.39	1.9027	.0054	.224
Clinton ²	1.58	.0587	4.17	.0617	.0012	1.633
Concord ¹	.01	.0167	2.53	1.6415	.0036	.005
Easthampton ¹	1.33	.0702	3.54	1.4134	.0161	.030
Framingham (Imhoff)	1.82	.0700	5.57	.9443	.0131	.671
Framingham (direct)	2.35	.0901	5.54	.5144	.0100	1.140
Franklin	1.12	.0902	6.03	.3905	.0131	.186
GARDNER (Gardner Area) ³	4.48	.2355	6.50	1.8917	.0168	.640
GARDNER (Templeton Area) ²	4.01	.1352	5.58	.3205	.0067	1.168
Hopedale ²	1.00	.0592	3.65	3.1845	.0016	.028
Hudson	1.91	.1273	4.84	.9282	.0183	.470
Leicester ³	.61	.0350	2.66	.2960	.0122	.042
Marion	.98	.0371	3.69	.4383	.0075	.463
MARLBOROUGH ²	1.49	.0680	5.18	1.1205	.0137	.376
Milford	2.13	.0811	5.32	.7624	.0089	.595
Natick	2.77	.0855	6.89	.1106	.0031	.816
North Attleborough ¹	.55	.0312	2.59	.1343	.0043	.292
Northbridge	.57	.0365	2.65	.8902	.0087	.321
Norwood ²	1.21	.0559	8.93	.3808	.0113	.411
PITTSFIELD ²	2.05	.1931	4.37	.2932	.0090	.449
Southbridge ²	3.67	.0637	4.58	.2899	.0085	.878
Spencer ¹	1.22	.0470	3.89	.0257	.0018	1.493
Stockbridge ²	.21	.0526	1.72	.4991	.0100	.136
Westborough ²	1.32	.0 80	9.02	.1357	.0029	.817
Winchendon ³	.77	.0175	2.40	.3665	.0020	.030

¹ Six samples.² Regular samples from two or more underdrains in one average.³ Four samples.TABLE NO. 6. — *Efficiency of Sand Filters (Per Cent of Free and Albuminoid Ammonia removed).*

[Parts in 100,000.]

CITY OR TOWN.	FREE AMMONIA.			TOTAL ALBUMINOID AMMONIA.			CHLORINE.		Rate of Operation with Even Distribution (Gallons per Acre per Day). ¹
	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	Per Cent Removed.	Applied Sewage.	Effluent.	
ATTLEBORO	2.61	.72	72	.41	.0738	82	3.47	3.80	68,000
BROCKTON	3.84	1.19	69	.45	.0600	87	5.83	7.39	—
Clinton	2.85	1.58	45	.66	.0587	91	4.86	4.17	51,000
Concord	2.03	.01	99	.58	.0167	97	2.61	2.53	70,000
Easthampton	4.12	1.33	68	.60	.0702	88	4.60	3.54	—
Framingham (Imhoff)	4.87	1.82	63	.60	.0700	88	6.14	5.57	41,000
Framingham (direct)	3.61	2.35	35	1.34	.0901	93	6.48	5.54	
Franklin	2.54	1.12	56	.25	.0902	64	3.52	6.03	72,000
GARDNER (Gardner Area)	6.30	4.48	29	1.20	.2355	80	6.15	6.50	—
GARDNER (Templeton Area)	5.42	4.01	26	.54	.1352	75	5.03	5.58	
Hopedale	4.85	1.00	79	.41	.0592	86	4.04	3.65	44,000
Hudson	5.15	1.91	63	.60	.1273	79	4.95	4.84	63,000
Leicester	2.78	.61	78	.52	.0350	93	2.99	2.66	—
Marion	1.80	.98	46	.35	.0371	89	3.37	3.69	147,000
MARLBOROUGH	4.47	1.49	67	.62	.0680	89	6.27	5.18	56,000
Milford	4.50	2.13	53	.41	.0811	80	5.84	5.32	46,000
Natick	3.05	2.77	9	.50	.0855	83	5.55	6.89	55,000
North Attleborough	2.17	.55	75	.28	.0312	89	2.79	2.59	93,000
Northbridge	2.81	.57	80	.31	.0365	88	2.59	2.65	59,000
Norwood	3.48	1.21	65	.59	.0559	91	11.47	8.93	61,000
PITTSFIELD	2.72	2.05	25	.52	.1931	63	5.14	4.37	97,000
Southbridge	4.66	3.67	21	.65	.0637	90	4.00	4.58	70,000
Spencer	3.74	1.22	67	4.63	.0470	99	3.89	3.89	—
Stockbridge	2.76	.21	92	.29	.0526	82	2.06	1.72	—
Westborough	4.25	1.32	69	.81	.0680	92	11.88	9.02	44,000
Winchendon	2.88	.77	73	.29	.0175	94	4.45	2.40	—

¹ See also Table No. 7.

TABLE No. 7. — *Extent of Sewerage Works, Rate of Flow, and Rate of Operation of Sand Filters.*

CITY OR TOWN.	Popu- lation, Census of 1925.	Approx- imate Length of Sanitary Sewers (Miles).	Approx- imate Number of House Con- nections.	ESTIMATED QUANTITY OF SEWAGE TREATED (GALLONS PER DAY).			Estimated Average Quantity of Sewage per Con- nection.	Net Area of Filter Beds (Acres).	Estimated Rate of Operation with Even Dis- tribution (Gallons per Acre per Day).
				Average for Year.	Average for Month of Maximum Flow.	Average for Month of Minimum Flow.			
ATTLEBORO	20,023	36.79	1,700	1,060,000	1,645,000	614,000	624	15.50	68,000
BROCKTON	65,343	102.24	8,347	3,058,000 ¹	4,922,000	1,842,000	366	—	—
Clinton	14,180	24.85	1,900	1,346,000 ²	1,835,000	1,037,000	708	26.23	51,000
Concord	7,056	17.39	613	386,000	655,000	297,000	630	5.48	70,000
Easthampton	11,587	21.39	1,321	—	—	—	—	2.20	—
FITCHBURG	43,609	—	—	2,959,000	4,546,000	1,920,000	—	—	—
Framingham	21,078	40.75	3,342	1,197,000	1,512,000	828,000	358	29.12	41,000
Franklin	7,055	14.20	823	234,000	421,000	95,000	284	3.24	72,000
GARDNER	18,730	35.31	2,447	—	—	—	—	12.50	—
Hopedale	3,165	7.08	368	165,000 ³	249,000	117,000	448	3.79	44,000
Hudson	8,130	13.98	1,080	563,000	740,000	373,000	521	9.00	63,000
Marion	1,271	3.93	201	170,000	375,000	113,000	846	1.15	147,000
MARLBOROUGH	16,236	35.88	2,613	1,141,000	1,889,000	658,000	437	20.19	56,000
Milford	14,781	24.30	1,703	428,000 ⁴	554,000	239,000	—	9.30	46,000
Natick	12,871	13.77	1,623	692,000	1,338,000	411,000	426	12.60	55,000
North Attleborough	9,790	17.41	971	653,000	768,000	548,000	673	7.00	93,000
Northbridge	10,051	15.70	953	709,000	800,000	636,000	744	12.00	59,000
Norwood	14,151	27.00	1,920	887,000	1,216,000	637,000	402	14.47	61,000
PITTSFIELD	46,877	73.93	6,356	4,026,000	4,776,000	3,404,000	633	41.15	97,000
Southbridge	15,489	—	—	869,000	1,146,000	624,000	—	12.50	70,000
Westborough	6,348	9.11	601	274,000	589,000	176,000	456	6.20	44,000
Winchendon	6,173	6.50	188	—	—	—	—	4.00	—
WORCESTER	190,757	331.31 ⁵	—	20,770,000	32,030,000	15,590,000	—	—	—

¹ Includes an average of 2,523,000 gallons per day to trickling filter and 535,000 gallons to sand filters.² Entire quantity of sewage not treated.³ New development not included in average.⁴ Records questionable. Amount treated by sand filters only.⁵ Includes 70.10 miles of combined sewers.

TABLE No. 8. — *General Features.*

CITY OR TOWN.	Year of Construction of and Additions to Works.	Depth of Under-drains (Feet).	Distance of Apart-drains (Feet).	Filtering Material.	Attention given to Disposal Works.
ATLBERO	1912, 1913	4-7	35	Excellent sand and gravel; found in place	One man all the time; others when necessary.
BROCKTON	1893, 1905, 1908, 1912	5-5	30	Good sand and gravel; found in place	One chemist in charge, foreman, day and night man, more when necessary.
Clinton	1898, 1899	8	60-70	Good sand and gravel; found in place	Two men all the time; others when necessary.
Concord	1889, 1928	none	-	Good sand underlaid with gravel; found in place	One man once a day.
Easthampton	1908	3-5	20-40	Good sand and gravel; largely found in place	One man all the time; others when necessary.
FITCHBURG	1914	-	-	Trickling filter — 10 feet deep	Chemist in charge; 1 foreman, 1 day and 2 night men.
Framingham	1890, 1924	-	-	Good sand and gravel	One man all the time; others when necessary.
Franklin	1915	4-5	26	Good sand and gravel	Very little attention; one man once in a while.
GARDNER (Gardner Area)	1891	5	20	Good sand; handled in construction	One man all the time; others when necessary.
GARDNER (Templeton Area)	1901, 1909	3-4	20-30	Coarse sand; handled in construction	One man all the time; others when necessary.
Hopedale	1900, 1923	3	35-60	Good material — sand and gravel	One man all the time; others when necessary.
Hudson	1904, 1910	5-6	50-100	Good sand and gravel; found in place	One man all the time; others when necessary.
Leicester	1894, 1928	4	8	Mostly good sand; handled in construction	Very little attention.
Marion	1906	5	-	Mostly good sand; pockets of fine sand and some ledge; largely found in place	One man every day in summer, every other day in winter.
MARLBOROUGH	1891, 1908, 1909, 1910, 1911	4-5-6	30-50	Rather fine sand; found in place	One man all the time; others when necessary.
Milford	1907, 1924	5	40	Rather fine sand; found in place; trickling filter	One man every day; others when necessary.
Natick	1896	6	36	Sand of good quality, but stratified; found in place	One man all the time; others when necessary.
North Attleborough	1909, 1910	5-6-5	55	Coarse sand and gravel; found in place	One man every day; others when necessary.
Northbridge	1906, 1907, 1920	4	50-75	Coarse sand and gravel; mostly handled	Two men all the time; others when necessary.
Norwood	1909, 1918, 1923, 1924	4-6	40	Good sand and gravel; partly handled	One man all the time; others when necessary.
PITTSFIELD	1901, 1915	4	35	Good sand; mostly found in place	Two men all the time; others when necessary.
Southbridge	1908, 1925, 1926	4	40	Fair sand and gravel; considerable quantity handled, some found in place	One man part of every day.
Spencer	1897, 1923	- ¹	-	Good sand and gravel; largely found in place	One man all the time; others when necessary.
Stockbridge	1899, 1921, 1922	3-4-5	23	Sand filters, good quality sand	One man all the time.
Westborough	1892, 1911	3-4-5	30-40	Irrigation area, rather fine sand	One man all the time.
Winchendon	1908	5	-	Good sand and gravel; handled in construction	One man all the time; others when necessary.
WORCESTER	1898 ^{2, 3} , 1925	4-6	35-50	Good sand and gravel; largely found in place	One man once in a while.
				Trickling filters, sand area not in use	Chemist in charge; several men all the time.

¹ Only three beds underdrained.² Year of first construction of sand filters. Many additions.³ Sedimentation tanks and sand beds abandoned June, 1925. Imhoff tanks, trickling filters and secondary tanks installed.

EXAMINATION OF SEWER OUTLETS DISCHARGING INTO THE SEA.

Special examinations were made of the new sewer outfalls at Gloucester, Salem and Lynn for the purpose of determining the extent to which sewage from these outlets could be traced.

INVESTIGATION RELATIVE TO SHELLFISH.

Some of the work of the Department on shellfish was removed by a special act of the Legislature of 1929 establishing the office of Supervisor of Marine Fisheries.

Inspections have been made to determine the extent of contamination at various points along the coast, and during the year the restrictions on the taking of shellfish were removed from a small portion of Quincy Bay where no evidence of pollution was found. Certain changes were made in the determination of the extent of contamination in the vicinity of Revere, and the restrictions were removed from the Pines River. Restrictions were also removed from certain of the estuaries tributary to the Ipswich River.

Large quantities of shellfish were taken from the contaminated areas in and about New Bedford and transplanted to clean waters under the supervision of the Department of Fisheries and Game, and the transplanted shellfish were released to be used as food when the Department's analyses have shown that evidence of pollution had disappeared.

Plans for a plant for the chlorination of shellfish at Newburyport were approved in June and money for the construction of this plant became available at the end of the year.

Under the provisions of Chapter 29 of the Resolves of 1929 the Commissioner of Public Health became a member of the Special Commission for the investigation of Boston Harbor. The Department has cooperated with the commission in examinations of the harbor and its estuaries and tributaries and the sewerage systems adjacent thereto. This work has been carried on largely by the Engineering Division of this Department in cooperation with the Engineering Departments of the Metropolitan District Commission, the Department of Public Works of Massachusetts, and the Department of Public Works and Department of Health of the city of Boston.

REPORT OF THE DIVISION OF WATER AND SEWAGE LABORATORIES.

H. W. CLARK, *Director.*

This Division, consisting of laboratories in the State House and the Lawrence Experiment Station and its laboratories, carried on its usual volume of analytical and research work during the year 1929. In pursuance of this work the samples as shown in the following table were analyzed chemically, bacterially or microscopically. The results of all these chemical analyses of public water supplies, rivers, sewage applied to and the effluents from municipal sewage disposal areas, etc., are summarized in tables presented in a report of the Division of Sanitary Engineering. Besides the analytical and research work a considerable amount of field work was done during the year in connection with the examination of water supplies, rivers, sewage disposal areas, etc.

The following table summarizes the analytical work of this Division and a resumé of some of its research work is given on following pages:

State House Laboratories.

Samples from public water supplies:	
Surface waters	2,939
Ground waters	1,249
Samples from domestic wells, ice supplies, swimming pools, etc.	371
Samples from rivers	1,268
Samples in connection with special Metropolitan water supply investigation	681
Samples from sewage disposal works:	
Sewages	558
Effluents	561
Samples of wastes and effluents from factories	75
Miscellaneous samples (partial analyses)	132
Samples in connection with the investigation of Boston Harbor	1,927
Special examinations of water (including field work) for manganese, lead, oil, alkalinity, fats, dissolved oxygen, carbonic acid, hydrogen ion, zinc and arsenic	3,273
Microscopical examinations	3,211

Lawrence Experiment Station.

Chemical examinations on account of investigations concerning the disposal of domestic sewage and factory wastes, filtration and other treatment of water supplies, swimming pools, and the investigation of the Merrimack and other rivers	1,280
Chemical samples in connection with the investigation of Boston Harbor	185
Mechanical and chemical examinations of sands	92
Bacterial examinations of water supplies, rivers, sewages and sewage filter effluents, ice, swimming pools, wastes, etc.	5,311
Bacterial examinations in connection with the investigation of Boston Harbor	1,520
Bacterial examinations in connection with methods of purification of sewage and water	584
Bacterial examinations of shellfish and sea waters	713

EFFECT OF CERTAIN ACIDS ON SLUDGE DIGESTION.

The sewage used at the Lawrence Experiment Station is pumped through about 1,500 feet of pipe. Over the entrance of this pipe is a strainer which excludes the coarser suspended solids. On account of this the sludge settling in tanks at the Experiment Station is of such a nature that only rarely is its pH below 6.0; this indicates that the strainer removes certain materials rich in carbon. Hence, the pronounced carbon dioxide and methane stages of fermentation reported at many places are less marked with Experiment Station sludge. To show this to

be true, two bottles of sludge to which small amounts of vegetable matter were added to increase the carbonaceous matters of the sludge quickly became more acid than our normal sludge and the carbon dioxide and methane stages of fermentation were noticeable.

Over one hundred sludge digestion experiments in gallon bottles have been carried on at the Experiment Station during the last three years, together with studies of digestion in Imhoff tanks of capacities varying from 300 to 1,250 gallons. (Reports of the Lawrence Experiment Station and an article entitled "Sludge Digestion and pH Control" in the *Journal of Industrial and Engineering Chemistry*, March, 1929, describe a portion of these investigations.) Some irregular results have been obtained, such as a sudden cessation of fermentation or sudden activity after a long dormant period, which were out of line with similar digestion experiments in bottles in this laboratory. To avoid drawing possible erroneous conclusions from one series of digestions it was decided in this study upon different acids to run five separate series several weeks apart. So many variables enter into sludge digestion, however, that it is not at all certain that results similar to those obtained in the series of experiments outlined here would be obtained with sludge from another source.

The digestions were carried on in gallon bottles fitted with rubber stoppers through which passed three glass tubes. One tube reached to just above the surface of the sludge, which was about three inches in depth; the second reached about half-way down the bottle and was bent at its upper end in order to deliver liquid to a beaker placed beside the bottle. As gas was evolved and collected in the upper part of the bottle, an equivalent volume of liquid was forced through this tube. This liquid, after being measured, was returned to the bottle through the first tube, displacing gas through the third tube reaching just through the stopper and provided with rubber tubing and a pinch-cock. Except while delivering gas, this tube was kept closed. This method of measuring the volume of gas proved more satisfactory than collecting it over water and although there is some loss of dissolved carbon dioxide through exposure of the liquid to the air, there is also a loss through solubility in water by the other method.

Known amounts of Lawrence sludge were added to a series of bottles which were then filled with sewage and kept at an average temperature of 70° F. One bottle was operated as a control. The pH of six others was gradually reduced to around 5.2 with normal solutions of the following acids: acetic, butyric, formic, lactic, oxalic and sulphuric. These represent four types of acids—the lower fatty, an hydroxy, a dibasic and a mineral acid. Lactic acid is the one most likely to be formed in acid sludge with possibly small amounts of other organic acids. A number of digestions were made in parallel in which the organic acid was added as the sodium salt of each acid. Contradictory results were obtained, so it is not certain whether the free acid or the salt is the more readily destroyed. This point is of interest in connection with the neutralizing of acid sludge with lime.

The condensed results of the five series of digestions are shown in the following table:

Five Series of Sludge Digestion Bottles to which Various Acids were Added.

Grams of Acid Added to Each Bottle.

SERIES.	Control Bottle.	Acetic Acid Bottle.	Butyric Acid Bottle.	Formic Acid Bottle.	Lactic Acid Bottle.	Oxalic Acid Bottle.	Sulphuric Acid Bottle.
1	—	—	10.80	21.00	2.61	17.20	1.42
2	—	15.48	—	11.37	3.69	4.05	4.11
3	—	24.30	30.57	35.50	37.80	39.60	1.71
4	—	26.40	21.56	23.50	37.35	35.10	7.11
5	—	22.80	7.92	39.10	3.60	10.58	0.49
Total	—	111.3 ¹	89.8 ¹	130.47	85.05	106.53	14.84

Cubic Centimeters of Gas Produced per Gram of Organic Matter in Sludge.

1	.	.	.	.	513	-	1,076	650	400	579	149
2	.	.	.	.	212	425	-	262	112	120	161
3	.	.	.	.	206	299	639	474	250	369	43
4	.	.	.	.	151	165	363	218	304	263	169
5	.	.	.	.	54	313	117	421	36	137	30
Average					228	301	549	405	221	294	110

Average pH during Digestion Period.

1	.	.	.	.	6.4	-	5.8	6.0	5.6	5.8	5.6
2	.	.	.	.	6.4	5.7	-	5.9	5.7	6.0	5.8
3	.	.	.	.	6.3	5.8	5.6	5.4	5.4	5.8	5.5
4	.	.	.	.	6.3	5.9	5.5	5.9	5.6	6.1	5.6
5	.	.	.	.	6.0	5.8	5.4	5.8	5.6	5.5	5.8
Average					6.3	5.8	5.6	5.8	5.6	5.8	5.7

¹ Calculated to the basis of five bottles.

Analyses were made but no particular study was made of the composition of the gas formed. The early stages of digestion gave the usual normal gas consisting of 20 to 25 per cent carbon dioxide and 65 to 75 per cent methane. In the later stages of digestion when the greatest amounts of acid were being destroyed, the carbon dioxide was from 40 to 70 per cent of the volume, with a corresponding decrease in methane. No hydrogen was found in any of the earlier fermentations so this determination was not regularly made. Toward the end of these experiments a few further tests were made for hydrogen but with negative results.

The pH of the sludge in all bottles before acid was added was well above 6.0. This was reduced to about 5.2 in two or three days by the addition of normal acid. This acid was destroyed gradually for the first week or so and then much more rapidly. Digestions were usually complete in from four to six weeks. As the acid was destroyed, the pH increased, frequently from 5.0 to 6.2 or so in twenty-four hours, this change representing the disappearance of 40 cubic centimeters of normal acid. It was impossible on account of this rapid change to maintain any definite pH. Each day enough acid was added to reduce the pH to 4.8, 5.0 or 5.2. The value of stirring the sludge, even though no fresh solids were added, was shown frequently toward the end of digestion by the renewal of fermentation after it had apparently ceased.

Of course the gas from the bottles containing the acidified sludge resulted partly from the decomposition of the organic matter of the sludge and partly from the decomposition of the added acid. In the later stages of the fermentations, most of the gas undoubtedly came from the acid. Fermentations in the organic acid sludges were always more prolonged than in the control sludge, hence it seems likely that some constituents of the sludge entered into the later fermentation as otherwise the acids might have been fermented for an indefinite period after the fermentation of the sludge ceased. The volumes of gas formed were not proportional to the amounts of the acids destroyed, indicating that in some digestions more sludge was destroyed than in others.

An inspection of the tables shows that the sludge with added lactic acid produced the smallest amount of gas of any except that with added sulphuric acid, and that the amount of lactic acid destroyed was also the least of the organic acids. In two of the series, however, relatively large amounts of lactic acid were destroyed, but much more slowly at first than was the case with the other acids. All of our results showed that lactic acid is the least readily attacked by the bacteria of digesting sludge of any of the organic acids tested, but that under certain conditions the bacteria may slowly become accustomed to this acid and will then ferment it readily. Sulphuric acid was included merely to have a mineral acid for comparison. Free mineral acids are injurious to all bacterial action and of course such acids would rarely or never be found in sludge. In two of the sludges acidified with sulphuric acid considerable acid was reduced with the formation of hydrogen sulphide, requiring frequent addition of acid to maintain the pH at around 5.2.

It was evident from our results that organic acids as such are not necessarily injurious to actively fermenting sludge, but that their presence at the beginning

of fermentation is harmful especially if in sufficient amount to reduce the pH to around 5.0 or less. This is shown by the results of a series of digestion experiments consisting of a control and four others, the pH of these being reduced initially with acetic acid to 4.8, 5.0, 5.2 and 5.4, respectively, and maintained as nearly as possible at these figures for a number of weeks.

The amounts of gas produced in these bottles are given below:

pH OF SLUDGE BOTTLE.										Cubic Centimeters of Gas per Gram of Organic Matter.
6.4 (control)	.	.	.	.	.	.	.	.	.	157
4.8	.	.	.	.	.	.	.	.	.	0
5.0	.	.	.	.	.	.	.	.	.	18
5.2	.	.	.	.	.	.	.	.	.	224
5.4	.	.	.	.	.	.	.	.	.	184

The bottle with a pH of 5.0 showed little fermentation and that kept at 4.8, none. When the pH was kept at 5.2, however, there was active fermentation and it is apparent from this that there is a sharp limit to the amount of acid in the sludge which will stop fermentation or permit it to occur. When fermentation is active, however, the pH can be reduced repeatedly to 4.8 or 5.0 without ill effects as was shown frequently during the progress of this work.

FORMATION OF CALCIUM CARBONATE DURING SLUDGE DIGESTION.

On page 51 of the report for 1927 it was shown that during digestion of sludge, calcium carbonate is formed, and it was pointed out that this was one of the causes of increased pH as digestion progresses. Destruction of organic acids and formation of ammonium carbonate are other contributing factors. To study this further, twenty gallons of Lawrence sludge and twenty gallons of Brockton sludge were placed in tanks 8 inches in diameter and 8 feet deep, and the pH, alkalinity of the liquid to methyl orange and calcium in solution as carbonate were determined at intervals of several days. Calcium is present as bicarbonate rather than carbonate.

The alkalinity of the Lawrence sludge at the beginning of the experiment was 30 parts in 100,000 and reached a maximum of 107 after forty-two days and then decreased to a constant value of 95 after one hundred and forty-two days. The pH at the start was 6.9 and reached a maximum of 7.3 in about forty-two days and declined to 7.0. The calcium carbonate in solution at the start was 7.8 parts and reached a maximum of 41.5 parts after forty-two days and decreased to around 30 parts. The changes in the Brockton sludge were similar in point of time. The alkalinity went from 36 to 106, the pH from 6.1 to 7.2 and the calcium carbonate from 10.1 to 29.3. Apparently a considerable part of the methyl orange alkalinity is due to ammonia as the calcium carbonate is not sufficient to account for the increase. The amount of calcium carbonate in the form of bicarbonate that can be present is limited by its solubility.

DIGESTION AND STABILIZATION OF SEWAGE SLUDGE WITH NITRIFIED SEWAGE FILTER EFFLUENTS. — REDUCTION OF GROWTHS OF MICROSCOPIC ORGANISMS.

From 1916 to 1919, inclusive, sewage sludge was placed in a three-compartment tank through which were passed effluents of certain trickling or contact filters and the results of this experiment are given in the reports of the Department for those years. This process utilizes the oxygen of the nitrates to oxidize and stabilize the sludge, and besides the loss of nitrate nitrogen there is a loss of total nitrogen from the applied filter effluents. With Lawrence sludge an inoffensive fermentation is set up in a very short time and the gas evolved consists mostly of nitrogen with some methane and a small volume of carbon dioxide. The carbon dioxide is largely fixed or held by the base remaining from the decomposition of nitrates. Experiment Station sludge is not acid and generally ferments spontaneously. When acid sludges are treated in this way, the alkalinity from the base of the nitrates should have a beneficial effect by increasing the pH of the sludge.

High nitrates in effluents are harmful to the streams they enter because of heavy growths of organisms which are encouraged and maintained by these nitrates. Hence if nitrates in an effluent can be reduced, the effluent still remaining of good quality, and sludge digestion aided at the same time, a double result is achieved.

Because of more interest at present in sludge digestion and nitrate reduction than when the earlier work was done, the same tank was put in operation again on November 20, 1928, and a sand filter effluent was passed through or over the sludge held in the tank. The total amount of effluent used was approximately ten gallons for each gallon of sludge containing 0.5 per cent of dry matter, and the proper method of operating such a sludge digestion tank is to apply nitrates at such a rate that there will be enough remaining in the effluent coming from the tank, perhaps 0.2 part in 100,000, to insure stability.

Sludge from the Station settling tank was collected three times a week and applied during one month to each of the three compartments of Tank No. 483 in rotation, this giving a maximum storage of three months. Filter effluent was applied continuously to the bottom of the first compartment, passed from the top to the bottom of the second, and so on. The sludge added was in dilute form hence a considerable amount of liquid sewage was added, which is taken into account in the analyses and in calculating the loss of nitrogen.

The average percentage loss of the total nitrogen in the applied sand filter effluent and the liquid portion of the applied sludge, was 39.1; that is, 60.9 per cent appeared in the effluent of Tank No. 483. No attempt was made to measure the amount of sludge destroyed but changes in the composition of the sludge were determined and after treatment it was odorless and did not ferment on standing a month in the laboratory. One lot of sludge treated only six weeks gave a perfectly stable sludge and the indications are that with plenty of nitrate the time can be reduced to one month. Of course the time required to stabilize the sludge is a separate problem from the reduction of nitrates to the desired degree. Analyses of the dry sludge before and after digestion, together with Imhoff sludge from Tank No. 545 are shown in a following table.

Some drying experiments were made with Tank No. 483 and Imhoff sludges. The results were not strictly comparable because of the differences in the per cent of dry matter and the thickness of the dried sludge cake but apparently Tank No. 483 sludge drained more readily than the Imhoff sludge.

Certain tests were made on the time of development of green growths in bottles of the sand filter effluents before and after passing through Tank No. 483 and it was evident that these growths developed much more slowly in this sand filter effluent after passing through this sludge tank than before passage.

Sludge Analyses.

	PER CENT ON DRY BASIS.		
	Fats.	Nitrogen.	Loss on Ignition.
Sludge from Station Tank applied to Tank No. 483	26.3	3.45	70.2
Sludge from Tank No. 483 after 12 weeks' storage	16.6	3.25	61.8
Sludge from Imhoff Tank No. 545	10.8	3.26	51.3

Average Chemical Analyses.

Effluent from Sand Filters applied to Sludge Digesting Tank No. 483 (Including Liquid Portion of added Sludge).

[Parts in 100,000.]

SOLIDS.						AMMONIA.			NITROGEN AS —	
UNFILTERED.			FILTERED.			Free.	ALBUMINOID.		Nitrates.	Nitrites.
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.		Total.	In So- lution.		
-	-	-	-	-	-	1.41	.22	-	2.11	.1332
<i>Effluent from Sludge Digestion Tank No. 483.</i>										
43.5	15.1	28.4	40.7	14.1	26.6	1.70	.17	.10	0.59	.1023

Dangers of Sulphide and Acid Wastes from Tanneries.

On June 18 five men, while cleaning out a manhole on the sewerage system of one of the cities in this State, were overcome by hydrogen sulphide gas so suddenly and with the gas in such concentration that four died in the manhole and the fifth, while removed from it alive, died within twenty-four hours. This manhole had been entered by these men only an hour previous to their deaths without ill effect but when entered again the tragedy occurred. Six hours after these deaths in the manhole the Department of Public Health was notified and eight hours after the tragedy happened samples of air were taken from this manhole and other manholes in the vicinity.

Examination of these samples showed hydrogen sulphide present in amounts practically great enough to destroy human life. Undoubtedly much more hydrogen sulphide would have been found if the Department had been notified more promptly and samples collected within an hour or two of the deaths. Much dilution of the air in the manhole probably occurred during the eight hours intervening between the deaths and the collection of samples. No lethal gas other than hydrogen sulphide was present in any of the samples collected.

Hydrogen sulphide is not a gas ordinarily formed when strictly domestic sewage sludge ferments. There are certain regions, however, where it is formed from the sludge of domestic sewage especially where the water supply is rich in sulphates; that is, these sulphates become more or less precipitated in septic, Imhoff and other sludge digestion tanks and under such conditions they decompose with the formation of some sulphuretted hydrogen. Occasionally, but only occasionally, traces of this gas are found in the gases given off from sludge digestion tanks at New England municipalities.

As there was a large tannery on the same street as the manhole in which the deaths occurred, sewer pipes from which entered the city sewer, investigations of this tannery were made and it was found that large amounts of sodium sulphide were used in the dehairing process at this plant and also, of course, large amounts of sulphuric acid to neutralize the hides after this treatment. Further examination of the wastes from the plant made it evident that under the right conditions of flow or accumulation of tannery sludge in the sewer, hydrogen sulphide in large volumes might be formed by the action of sulphuric acid wastes upon the sulphide wastes.

Samples of these wastes taken to the laboratory for investigation showed that the strong sulphide waste from a vat at the plant would, when treated with acid, set free practically 10,000 cubic centimeters of hydrogen sulphide for every gallon of waste. Samples of waste from the outlets of the tannery to the city sewer and also from the outlets to the river showed that a gallon of certain of these wastes when treated with sufficient sulphuric acid, would liberate as much as 1,538 cubic centimeters of hydrogen sulphide. The wastes from the tannery entering the city sewer where the men were overcome liberated 1,394 cubic centimeters of hydrogen sulphide per gallon when treated with acid. When strong domestic sewage was treated in the same way this sewage liberated less than 5 cubic centimeters of hydrogen sulphide per gallon. A large volume of water estimated at from 500,000 to 1,000,000 gallons per day is used at this tannery in washing the hides as received and after different processes, hence the sulphide and other wastes are generally much diluted and it is probable that only occasionally do acid wastes enter either the river or the sewer; that is, dilution and mixture of wastes prevent this.

It was evident, however, from all these examinations and the deaths from hydrogen sulphide poisoning that at times fairly strong acid wastes must act upon the sulphide wastes.

DISSOLVED OXYGEN AND ITS DETERMINATION IN FRESH AND SALT WATER. —
REAÉRATION OF WATER.

Theriault in the U. S. Public Health Bulletin No. 151 gives a very good summary of the Winkler method of determining dissolved oxygen, its modifications and the precautions to be observed under various conditions. This method has been in use by this Division for over thirty years in practically its present approved

form and a number of precautions mentioned in the Bulletin have been observed by us independently, some of which are as follows:

The precipitated manganic hydroxide should be mixed once after a preliminary settling. This is absolutely necessary with salt waters and it is well to allow a period of at least ten minutes for this settling as the precipitated carbonates retard the absorption of oxygen. After the samples are acidified they should not be exposed to sunlight and the sooner they are titrated the better. In samples which have been allowed to stand for some time before acidifying, the precipitate frequently dissolves very slowly. This can be hastened by the addition of a few crystals of potassium iodide. The permanganate modification described in "Standard Methods," is necessary for waters, etc., containing much organic matter but when used with other waters tends to give low results.

When it comes to the question of re-aëration during the collection or handling of samples, or dilutions for B. O. D., the experience of this laboratory has been that while the precautions commonly used are theoretically correct, they are in a large measure unnecessary. It has been shown by a number of series of duplicate tests that results are practically identical whether the sample bottle is filled by direct dipping or by the standard method. Two such series are shown below. Of course, if extreme accuracy is desired, especially with samples low in dissolved oxygen, every possible precaution must be taken.

Dissolved Oxygen.

SAMPLE COLLECTED BY STANDARD METHOD.		SAMPLE COLLECTED BY DIPPING.	
Parts in 100,000.	Per Cent of Saturation.	Parts in 100,000.	Per Cent of Saturation.
.500	57.5	.496	57.0
.492	56.5	.500	57.5
.476	54.7	.500	57.5
.040	3.9	.048	4.7
.040	3.9	.048	4.7
.044	4.3	.044	4.3

Water takes up oxygen very slowly even when air is blown violently through it. In various tests, in a gallon bottle half full of water at 68° F., with a jet of air blowing through it, the average dissolved oxygen increased from 0.75 to 0.81 part in 100,000 in five minutes. In another test at 66° F., the dissolved oxygen increased from 0.61 to 0.89 part in ninety-seven minutes. Of course the rate of re-aëration depends on temperature and initial dissolved oxygen present. When the amount of aëration a sample receives on filling the bottle by dipping is compared with the above direct aëration, it will be readily seen that collecting by dipping can introduce generally only a negligible error.

BIOCHEMICAL OXYGEN DEMAND.

The biochemical oxygen demand of river water, samples of sewage, effluent of a sewage filter, etc., is the amount of oxygen required to stabilize the organic matter present by aërobic bacterial or other action. In analytical work, biochemical oxygen demand, or B. O. D., as it is usually expressed, is the amount of oxygen which is absorbed by a sample either by itself or when diluted with distilled water, or tap water containing much dissolved oxygen, or the nitrate oxygen absorbed by a sample to which known amounts of nitrate have been added. Oxygen absorbed tests were made as early as 1870 in England, although by a different method and the name now given this process is of fairly recent origin.

In 1900 (see pages 388-392, Report of Massachusetts State Board of Health, 1900, and report of H. W. Clark to the Charles River Dam Commission, 1901) much work was carried on to show the amount of oxygen which would be absorbed by polluted water under different conditions, also the extent to which water under different conditions could be polluted without the exhaustion of oxygen and the development of odors. Following this, many tests were made

using an incubation period of twenty-four hours only. In 1913, a period of five days at 70° F. was adopted and a quite extensive study of the accuracy of the method made. It was found by this study that the B. O. D. values were not constant but varied with the volume of sewage, river water or effluent tested but not in proportion to the volume of the sample in the dilutions prepared for incubations. This inaccuracy is well known but is rarely mentioned in published articles on B. O. D. Because of this inaccuracy and because the test is of less value in studies of Massachusetts streams than those of many other states, it has been little used in this Division.

During 1929, however, a study of the Merrimack River by this method was made. Samples were collected on six dates at stations from near the New Hampshire line, where the stream enters the State, to its mouth at Newburyport. All samples collected were incubated five days at 70° F. in a tank of water with thermostatic temperature control. In practically every case two different dilutions were tried and duplicates of each incubated. The duplicate determinations as a whole gave satisfactory checks, but of the two dilutions, the greater gave average results 46 per cent higher than the lesser dilution. The average of the four determinations, excluding any which were obviously incorrect, was taken, however, as the B. O. D.

At first distilled water buffered with 50 parts in 100,000 of sodium bicarbonate, as recommended by some workers, was used for dilutions. It was noticed that this water lost an appreciable amount of oxygen on incubation by itself. The addition of sodium phosphate caused an even greater loss. Finally, stored tap water was used. This did not lose oxygen on incubation and had the advantage of having the same mineral constituents as the river samples. It was evident from our work that if a synthetic water is to be used, it should approximate in composition the waters under examination or, in the case of sewage or sewage effluents, of the body of water into which they are to be discharged.

The following tables show the B. O. D. and the dissolved oxygen of the river at the time samples were taken, also the results of oxygen consumed and albuminoid ammonia determinations of duplicate samples. In comparing the results at each station, it must be assumed that each sample represented the average conditions during the day and that the dams at Lowell and Lawrence were passing the normal flow of the river. Each of the ponds formed by these dams allows in summer about two days' storage, this depending of course on the flow of the river.

Comparing the B. O. D. with the dissolved oxygen available at each station, starting at Tyngsborough near the New Hampshire line, it will be noticed that the dissolved oxygen in the river water is more than sufficient to satisfy the five-day B. O. D. of the river until the station below Lawrence is reached. From this point down the river to its mouth, the dissolved oxygen was insufficient during the greater part of the period of examination. In this connection the use of a five-day B. O. D. value may seem inconsistent because inside of ten hours probably all the water from Lawrence down-river will be out to sea with the exception of that held back by the tides. However, the five-day B. O. D. may be considered as an arbitrary measure of organic matter, as, in fact, it actually is. It is significant that it is also below Lawrence that the river first shows physical indications of serious pollution.

Comparing the increased B. O. D. of the river water caused by the sewage and trade wastes of Lowell, Lawrence and Haverhill, it will be seen that Lawrence adds far more in proportion to population than either of the other two. There is a similar increase in albuminoid ammonia and oxygen consumed.

Tables showing B. O. D., Dissolved Oxygen, Oxygen Consumed and Albuminoid Ammonia Determinations of the Merrimack River at Stations along its Course from just below the New Hampshire Line to Newburyport.

Tyngsborough.

[Parts in 100,000.]

1929.	B. O. D.	Dissolved Oxygen.	Oxygen Consumed.	Albuminoid Ammonia.
June 7 . . . . .	.16	.69	.47	.0248
June 26 . . . . .	.285	.58	.53	.0182
July 10 . . . . .	.18	.61	.60	.0200
July 22 . . . . .	.20	.66	.32	.0218
August 20 . . . . .	.23	.65	.79	.0260
September 17 . . . . .	.185	.57	.58	.0238
October 23 . . . . .	.27	.75	1.06	.0166
November 22 . . . . .	.165	.95	1.14	.0196
Average . . . . .	.21	.68	.69	.0214

Above Lowell.

June 26 . . . . .	.40	.62	.53	.0240
July 10 . . . . .	.205	.70	.61	.0226
July 22 . . . . .	.265	.65	.33	.0224
August 20 . . . . .	.275	.68	.72	.0298
September 17 . . . . .	.25	.71	.63	.0264
October 23 . . . . .	.24	.75	1.01	.0222
November 22 . . . . .	.225	1.00	1.03	.0234
Average . . . . .	.27	.73	.69	.0244

Below Lowell.

June 7 . . . . .	.56	.71	.50	.0358
June 26 . . . . .	.64	.67	.59	.0244
July 10 . . . . .	.285	.72	.63	.0244
July 22 . . . . .	.43	.65	.35	.0244
August 20 . . . . .	.37	.65	.78	.0424
September 17 . . . . .	.28	.70	.68	.0280
October 23 . . . . .	.26	.66	.94	.0334
November 22 . . . . .	.42	.97	1.04	.0270
Average . . . . .	.41	.72	.69	.0300

Above Lawrence.

June 7 . . . . .	.23	.67	.49	.0280
June 26 . . . . .	.60	.57	.56	.0276
July 10 . . . . .	.19	.65	.68	.0218
July 22 . . . . .	.49	.56	.38	.0266
August 20 . . . . .	.46	.57	.74	.0326
September 17 . . . . .	.23	.50	.68	.0388
October 23 . . . . .	.22	.71	.79	.0342
November 22 . . . . .	.24	.93	.70	.0236
Average . . . . .	.33	.65	.63	.0292

Below Lawrence.

June 8	2.49	.63	2.76	.0710
June 26	1.51	.44	1.20	.0696
July 10	1.74	.32	2.10	.0465
July 22	1.67	.46	0.80	.0560
August 20	2.40	.53	0.86	.0664
September 17	2.32	.53	1.20	.1000
October 23	1.31	.42	1.68	.1180
November 22	1.34	.92	1.54	.0700
Average	1.80	.53	1.52	.0747

Above Haverhill.

June 8 . . . . .	.44	.55	.59	.0308
June 26 . . . . .	.62	.65	.81	.0330
July 10 . . . . .	.57	.42	.90	.0356
July 22 . . . . .	.51	.57	.59	.0404
August 20 . . . . .	.40	.19	.80	.0530
September 17 . . . . .	.76	.42	1.06	.0630
October 23 . . . . .	.82	.38	1.04	.0552
November 22 . . . . .	.53	.83	.85	.0412
Average . . . . .	.58	.50	.83	.0440

Tables showing B. O. D., Dissolved Oxygen, Oxygen Consumed and Albuminoid Ammonia Determinations of the Merrimack River at Stations along its Course from just below the New Hampshire Line to Newburyport — Concluded.

Below Haverhill.

[Parts in 100,000.]

1929.	B. O. D.	Dissolved Oxygen.	Oxygen Consumed.	Albuminoid Ammonia.
June 26 . . . . .	.63	.33	.82	.0340
July 10 . . . . .	.72	.41	.86	.0356
July 22 . . . . .	.49	.27	.64	.0420
August 20 . . . . .	.57	.11	.74	.0470
September 17 . . . . .	.57	.17	.85	.0480
October 23 . . . . .	.49	.28	1.06	.0540
November 22 . . . . .	.49	.84	.83	.0388
Average . . . . .	.57	.34	.83	.0428

Amesbury.

June 26 . . . . .	.94	.33	.70	.0384
July 22 . . . . .	.955	.40	.79	.0440
August 20 . . . . .	.275	.18	.78	.0496
September 17 . . . . .	.39	.41	.75	.0488
October 23 . . . . .	.315	.29	.93	.0500
November 22 . . . . .	.43	.74	.87	.0364
Average . . . . .	.55	.39	.80	.0445

Newburyport (Chain Bridge).

June 26 . . . . .	.85	.38	.72	.0425
July 22 . . . . .	.955	.35	.81	.0384
August 20 . . . . .	.43	.17	.84	.0486
September 17 . . . . .	.43	.36	.78	.0540
October 23 . . . . .	.47	.58	.94	.0548
November 22 . . . . .	.62	.73	.93	.0380
Average . . . . .	.63	.43	.84	.0460

The previous discussion has not taken into account the actual amount of dissolved oxygen in the river or the theoretical B. O. D. of the sewage of the different cities. It has been found, however, by the studies of others that at a number of cities the B. O. D. of average sewage is not far from 50 grams daily per capita. In applying this value to the population of the Merrimack Valley, no allowance has been made for the large amounts of trade wastes, especially at Lowell and Lawrence or for the fact that some sections of the area are not sewered. This is another instance of the difficulty of calculating factors in relation to B. O. D., reaëration, etc. It is undoubtedly true, judging from our knowledge of wastes from industries entering the river at present, that their B. O. D. is much greater than that of the domestic sewage; for instance, the B. O. D. of various industrial wastes coming from the Lawrence mills, tested during this study, varied from 1,200 to 4,000 or from twenty-four to eighty times that of average domestic sewage.

The following table shows the amount of dissolved oxygen in millions of grams in the river below Lowell, Lawrence and Haverhill, the B. O. D. of the river below each, and the increase or decrease of oxygen at Newburyport compared with the figures at Tyngsborough. As the volume of the waste mill liquors at Lawrence is, as has been determined by previous investigations, equal or more than equal to the volume of domestic sewage entering the river, and as their average B. O. D. is at least twenty-five times that of the domestic sewage, the B. O. D. of the river below Lawrence is easily accounted for. No correction could be made for the effect of tributary streams or for the fact of sludge banks in the river.

Biochemical Oxygen Demand Data.

1929.	OXYGEN IN MILLIONS OF GRAMS.					
	June 26.	July 22.	Aug. 20.	Sept. 17.	Oct. 23.	Nov. 22.
Dissolved Oxygen in River:						
Below Lowell	101.8	45.0	36.2	43.0	23.6	72.0
Below Lawrence	138.0	36.2	34.4	39.4	26.5	82.4
Below Haverhill	103.2	21.2	7.1	12.6	14.0	75.2
At Tyngsborough	95.1	45.7	34.6	34.5	23.6	68.4
At Newburyport (Chain Bridge)	102.0	27.5	11.0	26.7	36.6	65.5
Increase at Newburyport over that at Tyngsborough after satisfying B. O. D.	23.5	1.6 ¹	7.0 ¹	8.8	29.6	13.7
B. O. D. of River:						
Due to Lowell sewage	36.6	11.7	5.3	1.8	0.7	14.5
Due to Lawrence and Methuen sewage and mill waste	285.0	92.9	121.3	162.3	68.2	120.0
Due to Haverhill sewage	0.0	1.6	11.0	13.9	26.6	6.1

¹ Decrease.

As stated several times, all these conclusions are deduced from a small amount of data but the work shows clearly the condition of the river in regard to dissolved oxygen and pollution in general. As shown also by the table, although the B. O. D. of the river water from Lawrence to the sea was greater than could be satisfied by the dissolved oxygen in the river water submitted to five-day incubation tests, yet dissolved oxygen was not exhausted at any point in the river owing to the fact that this polluted water was always reaching the sea in much less than five days.

CHARACTER OF THE SEWAGE USED FOR INVESTIGATIONS UPON SEWAGE PURIFICATION AT THE LAWRENCE EXPERIMENT STATION.

The following tables present the average analyses of sewage used during the year. "Regular sewage" is the sewage as pumped to the Station; "settled sewage" is the same sewage after passing through Imhoff Tank No. 545 and receiving a slight additional settling in a large tank used for supplying all the filters at the Station, except Nos. 1, 4 and 9A, which receive the effluent of Imhoff Tank No. 545.

Average Analyses.

Regular Sewage.

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
4.10	.66	.45	1.26	.78	8.1	4.59	1,010,000
Effluent from Imhoff Tank No. 545.							
3.95	.51	.29	0.95	.56	7.6	3.25	1,160,000
Settled Sewage.							
3.35	.51	.30	0.90	.54	7.4	3.14	1,140,000

Average Solids.

Regular Sewage.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
55.2	26.3	28.9	39.0	15.6	23.4	16.2	10.7	5.5
<i>Effluent from Imhoff Tank No. 545.</i>								
47.5	20.7	26.9	35.8	13.1	22.7	11.8	7.6	4.2
<i>Settled Sewage.</i>								
42.5	18.8	23.7	34.2	13.9	20.3	8.3	4.9	3.4

OPERATION OF HOUSEHOLD SEPTIC TANKS.

Two small septic tanks of the household type have been operated at the Station since June, 1920. These tanks, Nos. 507 and 508, are of concrete construction. The first is 4 feet long, 2 feet wide and 40 inches deep, with a sloping bottom and a capacity of 185 gallons; the second contains two compartments of the same size as the first tank; that is, it has a capacity of 370 gallons. Sewage enters each tank through trapped inlets and discharges through a pipe reaching fifteen inches below the surface of the sewage in the tank. A baffle is placed one-third of the distance from the inlet to the outlet and reaches to within eight inches of the bottom of the tank. The first tank receives fresh household sewage and the second, Lawrence sewage which is a comparatively stale sewage. Both tanks are so operated that theoretically the sewage is held within each for two days. During almost the entire period of operation the effluents from both tanks have been remarkably clear and comparatively odorless, although a slight hydrogen sulphide odor has been noted occasionally. In 1927 after about seven years' operation of the tanks, the accumulated sludge was removed and during that period 75 per cent of the organic matter of the sludge had been destroyed. At the end of 1929 sludge measurements were again made and at this time there were twenty-three inches in depth of sludge in Tank No. 507. The first compartment of Tank No. 508 contained about 1 inch of scum and 24 inches of sludge, the second compartment 16.5 inches of sludge. The sludge in all three compartments was practically odorless and resembled good Imhoff tank sludge. Measurements and analyses showed that of the total solid matter deposited in the tanks during these two and one-half years of operation, 46 per cent of the organic matter in Tank No. 507 and 48.6 per cent of that in Tank No. 508 had been destroyed.

The analyses of the dry sludges are as follows:

	Tank No. 507.	Tank No. 508.
Per cent fats	16.7	17.0
Per cent nitrogen	2.58	2.63
Per cent loss on ignition	62.6	43.8

*Average Analyses.**Fresh Sewage applied to Closed Septic Tank No. 507.*

[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
4.15	1.15	.66	2.03	1.15	6.2	6.86	900,000

Effluent from Closed Septic Tank No. 507.

4.73	0.43	.32	0.73	0.55	5.6	2.57	490,000
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Regular Sewage applied to Closed Septic Tank No. 508.

3.55	0.65	.45	1.22	0.79	7.7	4.27	680,000
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Effluent from Closed Septic Tank No. 508.

3.21	0.30	.19	0.56	0.34	6.8	2.10	340,000
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Average Solids.

Fresh Sewage applied to Closed Septic Tank No. 507.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
74.1	43.7	30.4	41.1	19.8	21.3	33.0	23.9	9.1
<i>Effluent from Closed Septic Tank No. 507.</i>								
34.8	15.0	19.8	31.6	12.3	19.3	3.2	2.7	0.5
<i>Regular Sewage applied to Closed Septic Tank No. 508.</i>								
53.6	25.8	27.8	36.3	14.4	21.9	17.3	11.4	5.9
<i>Effluent from Closed Septic Tank No. 508.</i>								
35.6	12.7	22.9	30.6	10.1	20.5	5.0	2.6	2.4

ACTIVATED SLUDGE PROCESS.

Experiments on the aëration of sewage have been carried on at the Experiment Station continuously since 1912 and descriptions and results of the various tanks have been published in the annual reports of the Department. Activated sludge Tank No. 485, started in 1917, is still in operation. It consists of three compartments 75 inches deep, each holding 230 gallons. The overflow from the last, comprising the purified sewage, and considerable sludge passes through two settling tanks of 600 and 160 gallons' capacity, allowing about seven hours' sedimentation during which the activated sludge settles out and is then pumped back to the first compartment. Air is applied at the bottom of each compartment through a filtros plate at a rate of approximately .5 cubic feet of air per gallon of sewage. The tank is operated at the rate of 7,500,000 gallons per acre daily. Rates are dependent largely on tank depth as a given amount of air will be equally as effective on deep as on shallow tanks. It has been the custom to retain about 20 per cent by volume of sludge in the tank, the excess being pumped to waste from time to time. During the year this surplus was at the rate of 405 pounds of dry sludge per million gallons of sewage treated.

The sewage applied to this tank was passed through an Imhoff tank and then received some settling in the supply tank. The effluent has been clear, stable and well nitrified. By the preliminary settling and activated sludge process, 918 pounds of suspended solids per million gallons of sewage were removed during the year, and the dry activated sludge examined contained 5.4 per cent nitrogen and 6.8 per cent fats.

Average Analyses.

Sewage applied to Activated Sludge Tank No. 485.

[Parts in 100,000.]

APPEARANCE.		AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	NITROGEN AS —		Oxygen consumed.	Bacteria per Cubic Centimeter.
Turbidity.	Color.	ALBUMINOID.						Nitrates.	Nitrites.		
		Free.	Total.	In Solution.	Total.	In Solution.					
-	-	3.43	.63	.34	1.05	.59	7.4	-	-	3.55	1,140,000
<i>Effluent from Activated Sludge Tank No. 485.</i>											
0.3	.43	1.55	.14	.10	0.26	.19	7.2	.59	.0763	1.15	80,000

Average Solids.
Sewage applied to Activated Sludge Tank No. 485.
[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
49.5	22.4	27.1	33.7	13.1	20.6	15.8	9.3	6.5
Effluent from Activated Sludge Tank No. 485.								
33.1	10.1	23.0	28.7	9.4	19.3	4.4	0.7	3.7

IMHOFF TANKS.

Two Imhoff tanks were operated during 1926, 1927 and 1928. Early in 1929 it was decided, however, that the sewage used at the Station did not furnish sufficient sludge for the operation of both so one was discontinued and all the sewage passed through No. 545. This tank is of concrete, 20 feet deep, with a settling compartment 7 feet 4 inches long by 1 foot wide and with gas vents 1 foot square at each end. The bottom of the settling compartment has a slope of 45° towards the center where there is a slot opening. The settling compartment has a capacity of 715 gallons giving a theoretical storage of 1.5 hours, and the digestion compartment has a capacity of 357 gallons. The digested sludge removed from time to time has been entirely inoffensive, black in color, containing an average of 8 per cent dry matter, and has had a pH of about 7.0. Settleable solids have amounted to 372 pounds of dry matter per million gallons of sewage treated. The average composition of the dry sludge has been, — fats, 10.8 per cent; nitrogen, 3.26 per cent; and loss on ignition, 51.3 per cent. Judging from laboratory experiments, Lawrence sludge as collected at the Station is more readily digestible than sludges containing more vegetable matter such as enters most large Imhoff installations.

Average Analyses.
Effluent from Imhoff Tank No. 545.
[Parts in 100,000.]

AMMONIA.			KJELDAHL NITROGEN.		Chlorine.	Oxygen consumed.	Bacteria per Cubic Centimeter.
Free.	ALBUMINOID.		Total.	In Solution.			
	Total.	In Solution.					
3.95	.51	.29	.95	.56	7.6	3.25	1,160,000

Average Solids.
Effluent from Imhoff Tank No. 545.
[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
47.6	20.7	26.9	35.8	13.1	22.7	11.8	7.6	4.2

INTERMITTENT SAND FILTERS OPERATED WITH UNTREATED SEWAGE. — BIOLOGICAL OXYGEN DEMAND OF EFFLUENTS.

Filters Nos. 1, 4 and 9A.

Each of these three filters is 1/200 of an acre in area and at the end of the year Nos. 1 and 4 had been operated forty-two years and No. 9A, 39 years. Up to January, 1926, these filters had received regular sewage without preliminary settling. For the last four years the sewage applied has been passed through an

Imhoff tank where some of the suspended solids have been removed. Filters Nos. 1, 4 and 9A were operated at rates of 46,900 19,200 and 46,900 gallons per acre daily, respectively, during 1929. For many years these filters have been operated at such rates that there is at the most only a very gradual increase in the amount of organic matter stored in the filters.

Filter No. 1 contains 5 feet in depth of sand of an effective size of 0.48 millimeter; Filter No. 4, 5 feet in depth of sand of an effective size of 0.04 millimeter and Filter No. 9A, 5 feet in depth of sand of an effective size of 0.17 millimeter. The surface of Filters Nos. 1 and 9A are trenched and ridged late in the fall, board coverings being placed over these trenches and the trenches on Filter No. 4 to help prevent the sand from freezing. The surface of Filter No. 4 is permanently arranged in circular trenches, 14 inches wide, which are filled to a depth of twelve inches with sand of effective size of 0.48 millimeter. Sewage is applied to these trenches, grass being allowed to grow on the ridges.

A few B. O. D. determinations made on these effluents during the summer gave the following average results:— Filter No. 1, 0.33 parts in 100,000; Filter No. 4, 0.02 and Filter No. 9A, 0.07. In every case there was an increase in nitrates on incubation which would account for part, at least, of the B. O. D.; that is, the oxygen required to form nitrates from ammonia was taken from the available dissolved oxygen.

Average Analyses.

Effluent from Filter No. 1.

[Parts in 100,000.]

TEMPERATURE (DEGREES F.).		AMMONIA.		Chlorine.	NITROGEN AS —		Oxygen con- sumed.	Alkalinity.	Bacteria per Cubic Centimeter.
Applied.	Effluent.	Free.	Albumi- noid.		Nitrates.	Nitrites.			
53	58	.3735	.0587	6.9	2.38	.0006	.53	—2.9	6,400
<i>Effluent from Filter No. 4.</i>									
53	57	.0513	.0206	6.3	2.43	.0029	.35	—2.5	590
<i>Effluent from Filter No. 9A.</i>									
53	57	.4264	.0368	5.9	2.29	.0005	.46	—2.6	2,200

OPERATION OF CONTACT FILTERS.

Only one contact filter, No. 175, is now in operation as a study of the permanency of this type of filter and as an example of this method of sewage purification. It was started in 1901, is 1/20,000 of an acre in area and contains 39 inches in depth of coke passing a 1-inch screen and retained on a 1/4-inch screen. During 1929 the filter was operated one five-hour cycle daily with sewage which had passed through an Imhoff tank and received a small amount of settling in a storage supply tank. It was rested one week on four occasions during the year. The effluent was well nitrified and always stable but contained rather more suspended matter than usual. Since 1901 it has been necessary to remove and wash the filtering material twice, — once in 1911 and again in 1920. Since 1920 the open space has decreased 31 per cent.

Average Analyses.

Effluent from Contact Filter No. 175.

[Parts in 100,000.]

Quantity Applied. Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen con- sumed.	Bacteria per Cubic Centi- meter.
	Free.	ALBUMINOID.				Nitrates.	Nitrites.		
		Total.	In Solu- tion.						
309,000	.86	.29	.21	.50	7.1	1.50	.1350	2.41	175,000

*Average Solids.**Effluent from Contact Filter No. 175.*

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
50.7	21.4	29.3	41.9	17.1	24.8	8.8	4.3	4.5

OPERATION OF TRICKLING FILTERS.

During the year eleven trickling filters were operated. The oldest filter, No. 135, containing 10 feet in depth of walnut size stone, has been in operation thirty years. Filters Nos. 452, 453, 454 and 455 are constructed of 4, 6, 8 and 10 feet, respectively, of crushed stone that will pass a $1\frac{1}{2}$ -inch screen and be retained by a $\frac{3}{4}$ -inch screen. Filters Nos. 473, 474, 475, inclusive, contain 6, 8 and 10 feet in depth, respectively, of coarser broken stone passing a $2\frac{1}{2}$ to a 3-inch screen and retained on a $1\frac{1}{2}$ -inch screen.

Three new filters, Nos. 571, 572 and 573 were started in July. These are constructed of 10 feet in depth of crushed stone that will pass a $1\frac{1}{2}$ -inch screen and be retained on a $\frac{3}{4}$ -inch screen, and are 1/20,000 of an acre in area. These filters are to be used in a study of the amount of nitrification at different depths.

*Average Analyses.**Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.*

[Parts in 100,000.]

FILTER NUMBER.	Quantity Applied. — Gallons per Acre Daily.	AMMONIA.			Kjeldahl Nitrogen.	Chlorine.	NITROGEN AS —		Oxygen consumed.	Bacteria per Cubic Centimeter.
		Free.	ALBUMINOID.				Nitrates.	Nitrites. <small>48</small>		
			Total.	In So- lution.						
135	1,331,000	1.21	.36	.21	.65	6.2	2.24	.0735	2.42	340,000
452	771,000	1.76	.38	.22	.70	6.8	1.70	.0360	2.66	190,000
453	798,000	2.03	.38	.21	.67	7.4	1.49	.2215	2.39	300,000
454	1,987,000	1.64	.31	.18	.53	7.1	1.51	.0860	2.00	350,000
455	3,269,000	1.83	.39	.21	.68	7.0	1.48	.0450	2.38	270,000
473	673,000	2.00	.39	.19	.69	7.3	1.41	.0360	2.64	260,000
474	1,622,000	2.73	.30	.22	.59	7.3	0.37	.0350	2.10	620,000
475	3,119,000	2.14	.37	.22	.65	7.1	1.21	.0680	2.44	410,000

*Average Solids.**Effluents from Trickling Filters Nos. 135, 452, 453, 454, 455, 473, 474 and 475.*

[Parts in 100,000.]

NUMBER.	UNFILTERED.			FILTERED.			IN SUSPENSION.		
	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
135	54.0	25.4	28.6	44.8	19.6	25.2	9.2	5.8	3.4
452	49.9	20.7	29.2	40.7	15.9	24.8	9.2	4.8	4.4
453	48.2	20.9	27.3	37.4	15.1	22.3	10.8	5.8	5.0
454	46.1	19.5	26.6	38.8	16.8	22.0	7.3	2.7	4.6
455	51.1	25.0	26.1	38.6	15.4	23.2	12.5	9.6	2.9
473	51.7	22.6	29.1	40.2	16.5	23.7	11.5	6.1	5.4
474	41.1	16.1	25.0	33.9	11.6	22.3	7.2	4.5	2.7
475	51.5	22.3	29.2	40.6	18.1	22.5	10.9	4.2	6.7

LAWRENCE CITY FILTERS.

As usual this report presents data in regard to the operation during the past year of the slow sand filters for the purification of the water supply of Lawrence. Lawrence has taken its water supply from the Merrimack River since 1875 and since 1893 it has been filtered. Since 1918 the filtered water has been treated with chlorine as an added factor of safety. Three filters are in use. The oldest,

2.2 acres in area, is divided into three sections, one of which is covered; the second, 0.75 of an acre in area was built in 1907 and is also covered; the third filter, covered also, was completed early in 1926 and is 0.75 of an acre in area. The average volume of water filtered daily during 1929 was 4,393,976 gallons, about 5 per cent less than last year and 14 per cent less than 1927, due to the continued industrial depression. Liquid chlorine was applied as a solution at the pump-well at the average rate of 1.34 parts in 1,000,000. This amount of chlorine is high compared with that used in other localities but has proved to be necessary. There have been no complaints about chlorine tastes on the low service which supplies the greater part of the city from the reservoir but owing to the arrangement of the pump intakes and chlorine supply, the high service standpipe frequently receives an excess of chlorine and some complaints have been received. One remedy for this condition is to pump to the high service standpipe direct from the reservoir. The thorough mixing and storage that the reservoir affords would eliminate all chlorine tastes and odors. Another remedy is to provide a separate chlorine supply for each pump.

Average Bacterial Analyses.

Merrimack River. — Intake of the Lawrence City Filter.

BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			PER CENT OF SAMPLES CONTAINING B. COLI.					B. Coli in 100 cc.
4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		.001 cc.	.01 cc.	0.1 cc.	1.0 cc.	10 cc.	
	Total.	Red.		Total.	Red.						
5,100	340	73	—	—	—	0	26	96	100	100	3,400
<i>Effluent from the Lawrence City Filter (Old Filter, East Open Section).</i>											
69	5	1	98.6	98.5	98.5	0	0	0	10	56	14
<i>Effluent from the Lawrence City Filter (Old Filter, East Covered Section).</i>											
67	3	0	98.7	99.1	100.0	0	0	0	12	50	16
<i>Effluent from the Lawrence City Filter (Old Filter, West Open Section).</i>											
49	3	0	99.0	99.1	100.0	0	0	0	8	38	11
<i>Effluent from the Lawrence City Filter (New Filter).</i>											
15	2	0	99.7	99.4	100.0	0	0	0	0	8	—1
<i>Effluent from the Lawrence City Filter (North Filter).</i>											
76	5	1	98.5	98.5	98.5	0	0	0	12	47	18
<i>Mixed Effluents as pumped to the Distributing Reservoir after Chlorine Treatment.</i>											
13	2	0	99.7	99.4	100.0	0	0	0	0	0	—1
<i>Water from the Outlet of the Distributing Reservoir.</i>											
49	4	0	99.0	98.8	100.0	0	0	0	0	6	—1
<i>Water from a Tap at Lawrence City Hall.</i>											
37	3	0	99.2	99.1	100.0	0	0	0	0	2	—1
<i>Water from a Tap at the Lawrence Experiment Station.</i>											
41	3	0	99.2	99.1	100.0	0	0	0	0	2	—1
<i>Water from a Tap on the High Service System.</i>											
49	3	0	99.0	99.1	100.0	0	0	0	0	8	—1

¹ Less than 1.

Average Chemical Analyses.

Merrimack River. — Intake of the Lawrence City Filter.

[Parts in 100,000.]

TEMPERATURE (DEGREES F.)	APPEARANCE.		AMMONIA.			Chlorine.	NITROGEN AS —		Oxygen consumed.	Iron.	Hardness.
			Free.	ALBUMINOID.			Nitrates.	Nitrites.			
	Turbidity.	Color.		Total.	In Solution.						
52	0.1	.38	.0162	.0251	.0188	.44	.018	.0012	.66	.0713	2.0
<i>Effluent from the Lawrence City Filter (Old East Filter).</i>											
53	0.0	.46	.0289	.0101	—	.54	.032	.0005	.46	.2002	2.7
<i>Effluent from the Lawrence City Filter (New North Filter).</i>											
51	0.0	.26	.0045	.0118	—	.44	.026	.0003	.49	.0440	2.2
<i>Water from the Outlet of the Distributing Reservoir.</i>											
53	0.0	.38	.0104	.0114	—	.66	.030	.0002	.42	.1103	2.3
<i>Water from a Tap at Lawrence City Hall.</i>											
54	0.0	.39	.0078	.0112	—	.67	.032	.0005	.40	.1135	2.3
<i>Water from a Tap at the Lawrence Experiment Station.</i>											
54	0.0	.38	.0063	.0101	—	.67	.033	.0002	.39	.1160	2.3

Average Solids.

Merrimack River. — Intake of the Lawrence City Filter.

[Parts in 100,000.]

UNFILTERED.			FILTERED.			IN SUSPENSION.		
Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.	Total.	Loss on Ignition.	Fixed.
6.51	2.58	3.93	5.91	2.28	3.63	.60	.30	.30
<i>Effluent from the Lawrence City Filter (Old East Filter).</i>								
6.48	2.18	4.30	—	—	—	—	—	—
<i>Effluent from the Lawrence City Filter (New North Filter).</i>								
5.64	2.10	3.54	—	—	—	—	—	—
<i>Water from the Outlet of the Distributing Reservoir.</i>								
6.10	2.18	3.92	—	—	—	—	—	—
<i>Water from a Tap at Lawrence City Hall.</i>								
6.25	2.26	3.99	—	—	—	—	—	—
<i>Water from a Tap at the Lawrence Experiment Station.</i>								
6.30	2.22	4.08	—	—	—	—	—	—

FILTRATION OF WATER WITH FILTERS IMPREGNATED WITH HYDROXIDE.

During the year, nine sand filters were operated that were loaded or impregnated with ferric or aluminum hydroxide. Filters of this type, originating at the Lawrence Experiment Station, have been operated continuously since 1917 and have been fully described in previous reports. All of these filters are operated as slow sand filters at a rate of 5,000,000 gallons per acre daily.

Two filters of this type were operated in 1927 with water from Middleton Pond, — the Danvers water supply. They contained sand of nearly the same grade but from two different sources and were loaded as nearly as possible in the same manner. One gave good results while the other did not, and as it was thought this

might be due to some differences in the sand, four 10-inch filters loaded with ferric sulphate and magnesium oxide were put in operation to test this. Four sands of the same effective size and having practically the same uniformity coefficient, but from different sources, were used. One was a beach sand. The differences in the effluents from these filters, Nos. 563, 564, 565 and 566, were not great enough to explain previous results. The remaining explanation is difference in ferric hydroxide. Ferric sulphate is made by the oxidation of ferrous sulphate by nitric acid with the necessary amount of sulphuric acid. It is difficult to maintain these three components in the proper proportion and a basic or acid product is liable to result. It seems probable that a basic precipitate of iron is undesirable and basic precipitates are liable to result when a dilute acid solution of ferric sulphate is applied to sand containing magnesium oxide. Because of unsatisfactory results from Filter No. 535, supposed to be due to basic precipitates, the filter was emptied and refilled with sand containing magnesium oxide in July, 1929. About three-quarters of the iron was precipitated as ferrous hydroxide by intermittent application of a solution of ferrous sulphate and allowing the filter to drain. The air entering the sand oxidized the ferrous hydroxide to ferric. It is necessary to use a ferric sulphate solution to combine with the remaining magnesium oxide.

Average Bacterial Analyses.

FILTER NUMBER.	BACTERIA PER CUBIC CENTIMETER.			PER CENT OF BACTERIA REMOVED.			B. Coli in 100 cc.
	4 Days 20° C.	24 HRS. — 37° C.		4 Days 20° C.	24 HRS. — 37° C.		
		Total.	Red.		Total.	Red.	
River Water	3,000	470	64	—	—	—	3,500
488	1,100	111	17	63.3	74.3	73.4	43
494	1,600	18	2	46.7	96.1	96.9	20
496	140	4	0	95.3	99.2	100.0	16
535	100	6	1	96.7	98.6	98.6	10
536	400	25	5	86.7	94.7	91.9	72
563	1,080	14	2	64.0	97.0	96.9	55
564	830	12	3	72.0	97.5	95.3	34
565	680	11	2	77.7	97.7	96.9	48
566	310	25	3	89.7	94.7	95.3	27

Data on Operation of Color Removal Filters since Beginning of Operation.

FILTER NUMBER.	Year Started.	AVERAGE GRAINS PER GALLON OF WATER FILTERED.		Number of Times Treated with NaOH.	Average Number of Days between Treatments.	Average Color.
		Caustic Soda.	Ferric or Aluminum Sulphate.			
River Water	—	—	—	—	—	.41
488	1917	.41	.047	64	61	.14
494	1918	.39	.064	67	58	.16
496	1918	.12	.022	16	216	.08
535	1929	—	—	—	—	.14
536	1924	.29	.13	20	89	.14
563	1928	—	—	2	—	.07
564	1928	—	—	2	—	.09
565	1928	—	—	2	—	.07
566	1928	—	—	2	—	.13

COMPARISON OF CONFIRMATION MEDIA FOR B. COLI.

In a comparison of media for confirmation of B. Coli, 322 fermentations were planted simultaneously on litmus lactose agar and eosin methylene blue agar, and as the results were practically identical, the use of eosin methylene blue agar was adopted. There is a considerable saving of time, and a great economy in the use of apparatus by this method.

STUDIES OF THE EFFECT OF CEMENT-LINED PIPES UPON WATER.

On February 1, 1928, three separate sections of new 4-inch cement-lined pipe were connected up in the pumping station of the Danvers water supply in Middleton and water under pressure allowed to pass through a 20-foot section at an

average rate from February 1, 1928, to December 23, 1929, of .089 gallons per minute. During the first eleven months, the increase in alkalinity and hardness was 0.6 part and 0.4 part in 100,000, respectively. At the end of twenty-two months this increase had gradually fallen off to 0.2 part alkalinity and 0.1 part hardness, and when the flow was stopped for twelve hours, the alkalinity of the water held in the pipes increased 0.7 part and the hardness 0.7 part in 100,000 also.

These experiments were made with a short length of pipe and a very slow flow, but it is reasonable to suppose that 40 feet of pipe and twice the flow would have given identical results. This relation can be extended even further so long as the increase in hardness is limited to about the values formed in these experiments. As the hardness in the water increases, the solvent action decreases. A short section of pipe made up of a number of special curved pieces of pipe, with an unmetered flow of water, gave practically identical results, and a third section in which the water was allowed to remain stagnant, except for the collection of samples, showed the amount of alkalinity that might accumulate in dead ends of mains. A maximum of 25.5 parts in 100,000 alkalinity to methyl orange, 23.8 to phenolphthalein and hardness of 36.4 parts was reached in the water held in this pipe. Incidentally, the water was practically decolorized.

It seems evident that the effect of a cement lining upon water will persist over a period of years or even indefinitely and that the amount of hardness imparted to water is dependent on the length of time the water is in contact with the cement.

Interesting field work has been called for upon this subject during 1929 at several municipalities in the State where the water has been rendered hard or otherwise objectionable by passing through cement-lined pipes.

REPORT OF DIVISION OF FOOD AND DRUGS.

HERMANN C. LYTHGOE, *Director*.

The Food and Drug Division, during the year 1929, has been engaged in the routine work of the enforcement of the milk, food and drug, slaughtering, cold storage, mattress, bakery, and soft drink laws. In addition, the Division has examined samples of liquor, narcotics, drugs, and chemicals for Police Departments.

There were 290 cases prosecuted, of which 22 resulted in a finding of not guilty, and 4 resulted in dismissal. Of these cases, 138 pertained to milk; 3 to butter; 1 to buttered pop corn; 12 to the pasteurization law; 6 to the sale of sewage polluted clams; 2 to watered scallops; 12 to meat and meat products; 14 to maple products; 1 to olive oil; 4 to unsanitary food conditions; 11 to violations of the bakery law; 46 to the sale of cold storage eggs; 3 to the misbranding of eggs; 17 to the false advertising of eggs; 2 to the sale of decomposed eggs; 14 to violations of the slaughtering laws; and 4 to violations of the mattress laws.

A report of these cases will be found in Table I.

There were 10,623 samples of milk collected and examined, of which 75% were above the standard. In considering this apparently high variation from the standard, it should be remembered that at least 25% of the samples collected come from suspected sources. The figures show that fully 87% of the samples contained 11.7% of total solids or more. Of the samples collected, 2.99% were either partially skimmed or watered, or both.

Experience shows that the milk sold by the milk dealers in the larger cities, where there is an efficient local milk inspector, will invariably be above the legal standard, whereas in those cities and towns where there is no milk inspector, or where the inspector is lax in his duties, the milk is more liable to frequently be found below the legal standard.

During the year, there was considerable attention paid to dealers who were specializing in low standard milk. Where the milk was substantially below the standard, these men were called into the office for hearings, and were informed that it was necessary for them to obtain milk from farmers producing milk actually above the legal standard and to pay the necessary additional price for such milk in order that the milk they were selling would conform with the standard. In the case of one locality, after several hearings and after an additional inspection which showed only a slight improvement, a public meeting was held at which the local authorities were present. The milk dealers were informed that unless immediate improvement were made in the quality of the milk being sold, each milk dealer would be given an opportunity to call upon the judge. The result of this meeting was a decided improvement in the quality of the milk supply of that town.

As a result of the follow-up work of this low standard milk, many notices were sent to producers that they would have the twenty days granted by statute to bring their herds up to the legal standard. Subsequent collections from these producers showed that in general they comply with the warnings sent by the Department.

The Division made bacteriological examinations of 1,199 samples of milk. There were 40 samples of certified milk, of which 9 had a count of more than 10,000, the highest count being 27,000 colonies per cubic centimeter. There were 32,000 samples of Grade A milk examined. The lowest count was 1,800. Fourteen samples had a count above 25,000; 3 had a count above 50,000; and 3 had a count above 100,000, the highest count being 260,000. Most of these high count Grade A milk samples were obtained from one person who was licensed to operate a pasteurizing establishment. His license was revoked by the Department.

There were 194 samples of pasteurized milk examined. The lowest count was 1,000. One hundred and fourteen had a count below 50,000; 126 had a count below 100,000; and 80 had a count above 50,000, the highest count being 720,000 colonies per cubic centimeter. These counts on pasteurized milk were made in connection with studies upon the sanitary condition of the pasteurizing estab-

ishments, and, in some instances, were used in connection with prosecutions for violating the pasteurization regulations.

Two hundred and fifty-nine samples of raw milk were collected directly from pasteurization plants, of which 168 were below 750,000, and 90 were above 750,000. The lowest count was 4,000; 78 were below 50,000; 153 were below 300,000; and the highest count was 17,000,000 colonies per cubic centimeter. Quite a few of these samples were obtained from one establishment, as a result of which the Department of Agriculture and the several Milk Inspectors of the cities where this milk was sold after pasteurizing began a systematized, organized attempt to bring down the bacteria count of the milk furnished by the producers, who, in this instance, were practically all residents of Massachusetts.

There were also examined 671 samples of raw milk, sold as such. These samples were collected in conjunction with the examination of pasteurized milk sold on milk wagons. The lowest count was 2,000; 196 had a count below 50,000; 415 had a count below 300,000; and 256 had a count above 300,000. The highest count was 7,400,000 colonies per cubic centimeter. Three samples of Grade A Massachusetts milk were obtained. The lowest sample had a count of 90,000. The highest sample had a count of 92,000.

From a study of these figures, we may assume that the bulk of the pasteurized milk is delivered to the consumer with a relatively low bacteria count; the bulk of the Grade A milk pasteurized sold conforms with the regulations of the Department requiring a relatively low count; the raw milk going to the pasteurizing plants on the whole compares very favorably with the raw milk sold to the public, the figures being 58% in the first instance, and 62% in the second instance.

Foods Other than Milk.

There were 1,424 samples of food other than milk examined, of which 351 were either adulterated or misbranded. There were 16 samples of adulterated butter obtained, some of which were submitted by the Department of Agriculture.

There was one sample of cider obtained, which was found not to be cider, but was a mixture of syrup and water made in imitation of cider.

Fifteen samples of clams were found to be adulterated by the addition of water.

Four samples of cream were below the legal standard, or contained less fat than the grade of cream specified.

Ten samples of dried fruits bleached with sulphur dioxide were sold without the necessary label appraising the customer of that fact.

One hundred and sixty-five samples of eggs were either falsely advertised as fresh eggs or were misbranded as "Fresh Eggs," or were cold storage eggs sold as other than storage eggs, or were cold storage eggs sold without the necessary label.

Seven samples of adulterated maple sugar were obtained, and 26 samples of adulterated maple syrup. In the case of maple syrup, the bulk of this material was obtained from restaurants where it was served as "Griddle Cakes and Maple Syrup" or "Waffles and Maple Syrup," etc.

There was 1 sample of decomposed ham served to an inspector, who ordered ham and eggs for his breakfast.

Eleven samples of Hamburg steak were found to contain preservatives, and were not so labeled.

One sample of liver was falsely labeled as "Calves' Liver," when it was in fact Beef Liver.

Forty-six samples of adulterated sausages were obtained. These sausages either contained cereal in excess of 2% or were colored, or, in some instances, were decomposed.

There were obtained 9 samples of adulterated olive oil. Many of these samples were obtained with a view of apprehending certain persons doing an interstate business with their personal automobiles and not through a common carrier. Many of these investigations were made as a result of information submitted by the U. S. Department of Agriculture. It seems to be a difficult matter to secure a conviction in the U. S. Courts for sales of this character, the sale apparently taking place in the jurisdiction of the state where the delivery is made.

There was one sample of relish obtained, which was misbranded.

Ten samples of scallops were obtained, which were adulterated by the addition of water.

There were two samples of sugar containing foreign material obtained during the year. These samples were submitted by a person claiming to have found hair in the packages after purchase. The hair was in the opened packages delivered to this Department. Investigation of the balance of the product in the store from which the sugar was said to have been purchased showed no sugar containing any hair. The single sample of tea obtained was reported to be adulterated as it was mouldy.

There were 25 samples of vinegar collected and examined, which were below the legal standard or were adulterated.

Samples of food examined during the year, which were found to be free from adulteration, were, — canned fruits and vegetables, coffee, confectionery, corn, oil, corn syrup, cream of tartar, flavoring extracts, flour, honey, ice cream, jams and jellies, orange juice, salad dressings, soda water, syrups, and soft drinks. The salad dressings were examined for the possible presence of mineral oil. Some years ago, the Department found that two manufacturers of salad dressings were using mineral oil as an adulterant. Samples of all of the standard brands were collected, and no mineral oil was found.

A summary of the statistics of food will be found in Table 1.

Drugs.

There were 166 samples of drugs examined, of which 24 were found not to conform with the requirements of the Pharmacopœia. One was a sample of ether; 4 were samples of lime water; and 19 were samples of spirit of nitrous ether. The balance of the drugs were found to conform to the law. The ether was examined in view of the fact that such material will deteriorate after purchase, and under certain conditions will not be safe for anæsthetic purposes. The one sample found to be unsafe was the last of the stock in the drug store.

The adulteration of drugs is not the problem it was some years ago. The retail druggist formerly made most of the preparations upon his shelves. Now he buys most of them from the reliable wholesale houses who make the preparations as required by the Pharmacopœia, and who assay each lot before it is put into circulation. Because of this change in the commercializing of drugs, there has been a very marked improvement in the quality of such drugs sold by the average drug store. This should not be construed as a criticism of all druggists. Formerly, there were many druggists in the state who always served standard drugs where such were called for. There were only a few druggists who endeavored to make money by falsifying their drugs.

Pollution of Shellfish.

The Division has done considerable work upon the bacteriological examination of shellfish. There were 178 samples collected, of which 11 were found to be sewage polluted. There were 84 samples of clams in the shell, 6 with bacillus coli score of from 140 to 230. There were 78 samples of shucked clams examined, 1 with a score of 230, and 1 with a score of 5,000. There were 13 samples of quahogs examined, 1 with a score of 140. There were 3 samples of mussels and winkles examined, 1 with a score of 140.

These figures show that it is apparently impracticable to stop the taking of shellfish from sewage polluted areas. The figures, however, show that the bulk of the shellfish examined during 1929 came from areas which were not sewage polluted.

A number of cases were prosecuted and preparations are being made by the defense to take a few cases up to the Supreme Court both on the question of sewage pollution and on the question of the presence of added water.

The police departments submitted 111 samples of narcotic drugs and chemicals, of which 26 were examined for injurious ingredients with negative results. Of these samples, 40 were morphine; 12 were opium; 4 were cocain; 6 were strychnine; 5 were hair tonics; and several were samples alleged to be used for the

purpose of procuring abortions. One sample in a lead bottle contained water, sulphuric acid, boric acid, oxalic acid, lead, zinc, iron, and phosphorous.

One sample of cloth containing sulphuric acid was submitted. This resulted in a conviction of the person who threw the sulphuric acid on the material in a store.

One sample consisting of fish oil and valerianic acid was submitted, said to have been put in a motion picture theatre and the stopper removed from the bottle, thereby causing a very unsatisfactory odor. The police department was unable to find the person putting the material in the theatre.

The Division of Fisheries and Game submitted one sample of sausage, which was found to contain strychnine and was intended as bait to destroy foxes.

Liquor.

The Police Departments submitted 7,047 samples of liquor for examination. These samples were obtained from 156 cities and towns and from the Department of Public Safety, 119 towns each submitting less than 25 samples, submitted in all 780 samples.

A summary of the analyses of these samples will be found in Table 4.

There were 170 liquor samples out of a total of 4,411 samples of alcohol extracts and distilled spirits, which contained methyl alcohol. This represents but a very small amount of the total liquor collected. The percentage of methyl alcohol in the samples varied from 0.1 up to 5.9. Eighty-eight and four-tenths per cent of these samples contained less than 4% of methyl alcohol. Sixty-nine and five-tenths per cent of these samples contained less than 3% of methyl alcohol in the total sample. This quantity of methyl alcohol, as per the pharmacological examinations carried out a few years ago under the authorization of the Department, is not sufficiently extensive to cause any unusual concern. If, however, we consider the relation between the methyl alcohol and the total alcohol content of the liquor, we obtain figures which show, to some extent, a fairly high concentration of methyl alcohol in the total alcohol. Thirty-one and eight-tenths per cent of the samples contained less than 3% of methyl alcohol in the total alcohol; 46.5% of the samples contained less than 4% of methyl alcohol in the total alcohol; 24.3% of the total samples contained 6% or more of methyl alcohol in the total alcohol; and 11.2% of the samples contained from 8% to 17% of methyl alcohol in the total alcohol. The average methyl alcohol content of the liquor itself contained in this material was 2.12%, and the average per cent of methyl alcohol in the total alcohol of the same samples was 4.65%.

Pasteurization Establishments.

In connection with the work in the inspection of pasteurization establishments, the Department has but one full time inspector. There are nearly 600 pasteurizing establishments in the state, and it is therefore impracticable to give these plants the inspection which seems necessary. It is expected that in the next year, other inspectors engaged in collecting milk, food, and drug samples, will be trained in the methods of inspecting these plants, and will be able to make such inspections in connection with the collection of milk samples at the plants.

The results of the law have been very gratifying. The operators of the establishments, in many instances, voluntarily, prior to the passing of the law, in other instances, after receipt of the regulations, and in other instances, at the suggestion of the Department, purchased and installed up-to-date pasteurizing machinery and scrapped the obsolete and unsatisfactory equipment which they were using.

The regulations of cities and towns, requiring persons to test the cows, or to pasteurize the milk they are selling, has resulted both in an increase in testing and an increase in pasteurizing. Many persons who had been handling raw milk and were subject to such regulations as the local board of health saw fit to impose, found that they could not carry on pasteurizing establishments under the unsanitary conditions which they employed in connection with the raw milk which they formerly sold.

Most of the adverse reports brought in by the inspector were due to failure on the part of the plant owners to comply with the sanitary and precautionary regulations which were adopted by the Department. It was found that after a hearing or two, it was necessary to bring the offender before the court before he would comply with the regulations. Without doubt, considerable time would have been saved had the offenders been brought before the court at the first evidence of violation, but in the enforcement of a new law of this character, it is generally considered advisable to give the persons working under the law sufficient opportunity to comply with it before proceeding to prosecute. The prosecutions, however, in the bulk of the instances, brought immediate compliance with the law.

Many persons at hearings asked why it was that the persons who operated pasteurization establishments were obliged to do such things as sterilize the bottles in which the milk was put and to cap the bottles with a machine capper, and to keep the floor, walls, and ceiling of the pasteurizing room clean, when persons who were handling raw milk were not obliged to go to the expense of such procedure. In each instance, the person was informed that the local boards of health made the regulations pertaining to the sanitary conditions of raw milk, and the state made the regulations pertaining to the sanitary conditions of pasteurizing establishments. Some persons saw fit to sell out their route and go out of the milk business; some saw fit to go back to selling raw milk; and others saw fit to comply with the regulations. One person was advised to go back to selling raw milk unless he could keep his place cleaner. He replied that he couldn't go back to raw milk because his milk would be sour before his customers consumed it.

Many of these smaller plants employ boys to do the work, and the boys are not properly informed as to the public health reasons for pasteurization. Such plants are frequently found operating in violation of the regulations.

Cold Storage.

There have been but few violations of the cold storage law, except as pertaining to eggs, which have already been commented upon. The warehouses were found to be operating under sanitary conditions, and, in general, the law relating to the holding of foods for a period not exceeding twelve calendar months has been complied with. A number of requests for extension of time have been made and acted upon. In all cases where extensions were granted, the condition of the goods was such as to warrant extension. Our action on these applications will be found in Tables 5, 6 and 7.

Slaughtering Inspection.

The usual nominations of slaughtering inspectors were made in March, and, fortunately, the bulk of the nominations were those of persons at that time holding office. Each new nominee was carefully investigated by one of the inspectors, and, if found unqualified for the position, his nomination was not approved.

The Department was obliged during the year to remove a few slaughtering inspectors who were found to be violating the law relative to making their inspections.

There were several prosecutions for violation of the slaughtering laws, the offences being, — slaughtering in the absence of the duly appointed inspector, and, on the part of the inspector, — violation of the regulations of the Department. One case, involving the shipping of diseased meat into Massachusetts, was tried in the U. S. Court in Burlington, Vermont, resulting in a conviction.

Mattress Investigation.

There were four cases involving the sale of improperly labeled mattresses, all resulting in conviction. One case went to the Supreme Court upon an Agreed Statement of Facts, resulting in a finding for the Commonwealth. As a result of this case, the bulk of mattresses made of certain material formerly sold under the term of "New Material" are now labeled "Secondhand Material."

Confiscations.

A list of the confiscations made by the inspectors is given in Table 8.

Tables 9, 10, 11, and 12 give the amounts of articles placed in storage during each calendar month, and the amounts of articles on hand in storage on the first day of each calendar month.

Table 13 gives a summary of the slaughtering inspections, together with the condemnations and reasons for condemnation.

TABLE 1. — *For Sale of Milk not of Good Standard Quality.*

NAME.	Address.	Court.	Date.	Result.
Adams, Arthur C.	Newbury	Newburyport	Oct. 30, 1929	Discharged
Baklini, Ayoub	Salem	Salem	July 10, 1929	Conviction
Beattie, Estelle	Harwichport	Harwich	Oct. 4, 1929	Conviction
Biltmore Cafeteria Incorporated	Taunton	Taunton	Apr. 8, 1929	Conviction
Briggs, Jennie	Reading	Woburn	Jan. 14, 1929	Conviction
Byron, James	Buzzards Bay	Barnstable	Aug. 28, 1929	Conviction
Carter, Fred W.	Buzzards Bay	Barnstable	Aug. 28, 1929	Conviction
Chandler, Leon	South Yarmouth	Barnstable	Sept. 13, 1929	Conviction
Chapman, Benjamin E.	Middleborough	Wareham	Sept. 19, 1929	Conviction
Christopholous, Chris	Buzzards Bay	Barnstable	Aug. 28, 1929	Conviction
Cincotta, Joseph	Waltham	Waltham	Dec. 3, 1928	Conviction
Daignealt, Adalord	Millers Falls	Greenfield	Feb. 21, 1929	Conviction
Deeg, Max	Salisbury	Amesbury	Oct. 9, 1929	Conviction
Dischini, Cosmo	Wellesley	Dedham	June 7, 1929	Conviction
Doyle, Helen	Wareham	Wareham	Sept. 19, 1929	Conviction
Eckhoff, Chris	North Bernardston	Greenfield	Aug. 30, 1929	Conviction
Edwards, Charles M.	Sterling	Clinton	Nov. 13, 1929	Conviction
Elkins, Dana H.	Wayland	Framingham	July 25, 1929	Conviction
Elkins, Dana H.	Wayland	Framingham	July 25, 1929	Conviction
Elkins, Dana H.	Wayland	Framingham	July 25, 1929	Conviction
Elwell, Albert	Newbury	Newburyport	Oct. 30, 1929	Discharged
Ferguson, Nina C.	Salisbury	Amesbury	Oct. 9, 1929	Conviction
Fitchburg Bon Ton Restaurant, Inc.	Fitchburg	Fitchburg	May 14, 1929	Discharged
Garland, Charles W.	East Sandwich	Barnstable	Sept. 13, 1929	Conviction
Geanakos, John	Salem	Salem	Dec. 14, 1928	Conviction ¹
Georjantas, Nicholas	Westfield	Westfield	July 9, 1929	Conviction
Gilbert, Edmund	Dedham	Dedham	Mar. 14, 1929	Conviction
Glover, Mildred	Lynn	Lynn	Mar. 13, 1929	Conviction
Hamel, Samuel J.	Orleans	Harwich	Sept. 20, 1929	Conviction
Hanlon, Hugh	Chelsea	Chelsea	July 11, 1929	Conviction
Helides, Ernest	Taunton	Taunton	May 27, 1929	Conviction
Horn, Ruth M.	Osterville	Barnstable	Sept. 27, 1929	Conviction
Houlihan, Michael J.	Ware	Ware	Dec. 19, 1928	Conviction
Hynes, Harold O.	Wayland	Framingham	Aug. 2, 1929	Conviction
Jarvis, James	Reading	Woburn	Aug. 30, 1929	Conviction
Javos, James C.	Reading	Woburn	Jan. 14, 1929	Conviction
Kay, Walter	Falmouth	Barnstable	Sept. 27, 1929	Conviction
Kelley, Elnathan	Harwich	Harwich	Sept. 20, 1929	Conviction
Lahage, Abe	Hull	Hingham	Sept. 20, 1929	Conviction
Laravire, Louis	Hyannis	Barnstable	Sept. 13, 1929	Conviction
Leland, James F.	Framingham	Framingham	Oct. 14, 1929	Conviction
Liopes, Peter	Lynn	Lynn	Sept. 24, 1929	Conviction
Lipshitz, David	Lanesborough	Pittsfield	Sept. 17, 1929	Conviction
Lysell, Charles	Wareham	Wareham	Sept. 19, 1929	Conviction
Mandrioli, Oliver	West Concord	Concord	Mar. 28, 1929	Conviction
Markos, Charles	East Dedham	Dedham	Mar. 14, 1929	Conviction
Martin, Benjamin	Deerfield	Greenfield	Feb. 21, 1929	Conviction
Masho, Sotel	Lynn	Lynn	Sept. 24, 1929	Conviction
Matzouranis, James	Chelsea	Chelsea	Sept. 4, 1929	Conviction
McDermott, Mary	Buzzards Bay	Barnstable	Sept. 5, 1929	Conviction
Melzard, George W.	East Sandwich	Barnstable	Sept. 13, 1929	Conviction
Moskos, Nicholas	Framingham	Framingham	June 21, 1929	Conviction
Mulvaney, Daniel A.	Ware	Ware	Dec. 19, 1928	Conviction
O'Connell, Charles E.	Chelsea	Chelsea	July 11, 1929	Conviction
Page, Frank	West Harwich	Harwich	Sept. 20, 1929	Conviction
Paloian, John	Watertown	Waltham	Apr. 29, 1929	Conviction
Parnell's Lunch	Northampton	Northampton	Dec. 20, 1928	Conviction
Perkins, Fred R.	Montague	Greenfield	Feb. 21, 1929	Conviction
Pippin, John J.	Buzzards Bay	Barnstable	Aug. 28, 1929	Conviction
Rappas, Paul	Cambridge	Cambridge	Aug. 5, 1929	Conviction
Ristuccia, Mary	Waltham	Waltham	Dec. 3, 1928	Conviction
Robicheau, Joseph	Harwich	Harwich	Sept. 20, 1929	Conviction
Rodzen, Anthony	Hadley Center	Northampton	Aug. 8, 1929	Conviction
Rust, Forrest W.	Topsfield	Salem	Oct. 2, 1929	Conviction
Seoulogenos, John	Salem	Salem	Feb. 6, 1929	Conviction
Simon, Simon M.	Pittsfield	Pittsfield	Mar. 26, 1929	Conviction
Skaliotis, James	Peabody	Peabody	Dec. 24, 1928	Conviction
Smith, Moses	Newbury	Newburyport	Oct. 30, 1929	Discharged
Sornier, Maxine	Newbury	Newburyport	Oct. 30, 1929	Discharged

¹ Appealed.

For Sale of Milk not of Good Standard Quality — Concluded.

NAME.	Address.	Court.	Date.	Result.
Sotes, Maud W.	Onset	Wareham	Sept. 19, 1929	Conviction
Sotes, Nicholas	Onset	Wareham	Sept. 19, 1929	Conviction
Spiros, Naum	Peabody	Peabody	Dec. 24, 1928	Conviction
Troop, Ralph	Salem	Salem	Mar. 15, 1929	Conviction
Troupakes, Anthony	Cambridge	Cambridge	Dec. 7, 1928	Conviction
Velmiesis, Vasilio	Falmouth	Barnstable	Sept. 27, 1929	Conviction
Werner, Iyer	Ashby	Ayer	Oct. 14, 1929	Conviction
Whiting Milk Companies	Hull	Hingham	Sept. 25, 1929	Conviction
Zamboni, Fred	Plymouth	Plymouth	Nov. 8, 1929	Conviction

For Sale of Milk from which a Portion of the Cream had been removed.

Adam, Napoleon	New Bedford	New Bedford	Aug. 30, 1929	Conviction
Adler, Linus	Ashby	Ayer	Oct. 21, 1929	Conviction
Brogan, Frank D.	Hyannis	Barnstable	Dec. 19, 1928	Conviction
Bryla, Joseph	Westfield	Westfield	Aug. 7, 1929	Conviction ¹
Busby, Roy W.	Great Barrington	Great Barrington	Jan. 8, 1929	Conviction ²
Chandoian, Sarkis	Methuen	Methuen	May 13, 1929	Conviction
Friend, Lemuel	Gloucester	Gloucester	Apr. 22, 1929	Conviction ²
Hynes, Harold O.	Wayland	Framingham	Aug. 1, 1929	Discharged
Hynes, Thomas L.	Wayland	Framingham	Nov. 7, 1929	Conviction
Stevens, Raymond F.	Winchendon	Gardner	July 12, 1929	Conviction
True, Eben	Amesbury	Amesbury	Sept. 30, 1929	Conviction
Turner Centre System, Incorporated	Lynn	Lynn	Mar. 13, 1929	Conviction
Whitcomb, Herbert H.	Littleton	Concord	Oct. 1, 1929	Conviction
Zanchi, Angelo	Natick	Natick	Nov. 9, 1929	Conviction

For Sale of Milk containing Added Water.

Alibozek, Frank	Burlingame Hill	Adams	Oct. 24, 1929	Conviction
Axtell, James K.	Huntington	Huntington	Mar. 8, 1929	Discharged
Bailey, John	Dracut	Methuen	Apr. 15, 1929	Conviction
Baksanski, John	Westfield	Westfield	Aug. 7, 1929	Conviction ¹
Belyea, Edmond F.	Acushnet	New Bedford	May 17, 1929	Conviction
Bigis, Paulina	Chicopee	Chicopee	Nov. 6, 1929	Conviction ²
Bloss, William C.	Melrose	Malden	Jan. 8, 1929	Conviction
Bonalewsez, Walter	Rehoboth	Fall River	May 3, 1929	Conviction
Borowiec, Frank	Brimfield	Palmer	Jan. 11, 1929	Conviction
Boucher, Octave	Easthampton	Northampton	Apr. 24, 1929	Conviction
Brown, John D.	Fitchburg	Fitchburg	Nov. 1, 1929	Conviction
Burnham, Ellie W.	Athol	Athol	Dec. 17, 1928	Conviction
Busby, Roy W.	Great Barrington	Great Barrington	Jan. 8, 1929	Conviction ²
Busby, Roy W.	Great Barrington	Great Barrington	Jan. 8, 1929	Conviction ²
Cahill, Thomas P.	Saugus	Lynn	Mar. 13, 1929	Conviction
Chickering, Dwight Dan	Sterling	Clinton	May 10, 1929	Conviction
Czupryna, Frank	Belchertown	Northampton	Jan. 18, 1929	Conviction
Dmytryck, John	Millis	Franklin	Oct. 5, 1929	Conviction
Dragon, Apolnaire	Easthampton	Northampton	Oct. 31, 1929	Conviction ²
Draper, Fred B.	Westwood	Dedham	Apr. 9, 1929	Discharged
Drury, Harold B.	Athol	Athol	Dec. 17, 1928	Conviction
Duplisse, Wilber H.	Westborough	Westborough	Dec. 5, 1928	Discharged
Evans, Edward	Wilbraham	Palmer	Feb. 8, 1929	Conviction
Feeney, James J.	Andover	Lawrence	Sept. 9, 1929	Conviction ²
Fiske, James A.	Saugus	Salem	Feb. 14, 1929	Conviction
Hood & Sons, Incorporated, H. P.	Malden	Malden	Nov. 8, 1929	Conviction
Jermyn, Harry J.	Marblehead	Marblehead	Nov. 16, 1929	Conviction
Kochuski, Joseph	South Hadley	Northampton	May 23, 1929	Conviction
Lazotte, Joseph	Taunton	Taunton	May 27, 1929	Conviction ²
Moore, George	East Weymouth	Quincy	Dec. 17, 1928	Conviction
Nichols, Charles	Ashland	Framingham	Jan. 21, 1929	Conviction
Reid, James	Raynham	Taunton	Apr. 1, 1929	Conviction ²
Roumacker, Michael	Turners Falls	Turners Falls	June 28, 1929	Conviction
Russell, Ellen	Danvers	Salem	May 1, 1929	Conviction
Sankalowitz, Agatha	Millville	Blackstone	Nov. 15, 1929	Conviction
Shick, Philip	Malden	Malden	Dec. 13, 1928	Discharged
Silva, John	Hudson	Hudson	Feb. 27, 1929	Conviction
Smith, Clarence L.	Monson	Palmer	Jan. 11, 1929	Conviction
Soullre, Clara	Attleboro	Attleboro	Dec. 6, 1928	Conviction ²
Tefts, Joseph	Westfield	Westfield	Aug. 7, 1929	Conviction
Turcotte, Albert	Acushnet	New Bedford	May 17, 1929	Conviction
Whiting Milk Companies	Hull	Hingham	Sept. 25, 1929	Conviction
Whiting Milk Companies	Hull	Hingham	Sept. 25, 1929	Conviction
Whiting Milk Companies	Hull	Hingham	Sept. 25, 1929	Conviction
Young, Earl L.	South Hadley	Northampton	May 23, 1929	Conviction

Selling Unpasteurized Milk as Pasteurized.

Taavitsainen, Albin	Gardner	Gardner	May 31, 1929	Dismissed
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¹ Suspended for sentence to February 21, 1930.² Appealed.

For Violation of Pasteurization Law and Regulations.

NAME.	Address.	Court.	Date.	Result.
Baker, Perry J.	Lanesborough	Pittsfield	Oct. 23, 1929	Dismissed
Bookless, Max (2 counts)	Pittsfield	Pittsfield	June 21, 1929	Conviction
Boria, John	Millbury	Worcester	July 31, 1929	Conviction
Corkery, James J.	Cambridge	Cambridge	Oct. 10, 1929	Discharged
Corkery, John J.	Cambridge	East Cambridge	Aug. 8, 1929	Discharged
Dzois Dairy	Fall River	Fall River	Oct. 1, 1929	Conviction
Hood, H. P.	Fall River	Fall River	Oct. 1, 1929	Conviction
Parker Company, A. R.	East Bridgewater	Brockton	July 2, 1929	Conviction
Porter, Edson A.	Reading	Woburn	May 17, 1929	Conviction
Producers Dairy	Brockton	Brockton	June 18, 1929	Conviction
Soderholm, Hjalmar	West Bridgewater	Brockton	Sept. 17, 1929	Conviction

Butter (Low Standard).

Economy Grocery Stores Corporation	Chelsea	Chelsea	Apr. 4, 1929	Conviction
Rabinovitz, Max	Springfield	Springfield	Jan. 12, 1929	Conviction
Widlanski, Isaac	Springfield	Chicopee	May 7, 1929	Conviction

For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products.

CLAMS.

[Sewage polluted.]

Atwood Company, D.	Boston	South Boston	Sept. 24, 1929	Discharged
Carroll, John F.	Lynn	Lynn	Apr. 9, 1929	Discharged
Duffy, Joseph	Revere	Boston	Dec. 31, 1928	Conviction
Randall, Chaney	Revere	Boston	Apr. 9, 1929	Conviction
Smart, Phillip A.	Lynn	Lynn	Apr. 9, 1929	Discharged
Wells, Victor	Winthrop	Boston	Apr. 23, 1929	Conviction ¹

DRIED FRUITS.

[Contained sulphur dioxide.]

Phillips, Incorporated, A. H.	Northampton	Northampton	Mar. 21, 1929	Conviction
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EGGS.

[Misbranded.]

Great Atlantic & Pacific Tea Company	Worcester	Worcester	Jan. 31, 1929	Dismissed
Phillips, Incorporated, A. H.	Westfield	Westfield	Jan. 25, 1929	Conviction
Rosen, Simon	Worcester	Worcester	Jan. 17, 1929	Conviction

HAMBURG STEAK.

[Selling, or offering for sale, meat containing sodium sulphite in violation of the regulations of the Department of Public Health.]

Stark, Bernard W.	Roxbury	Roxbury	Dec. 27, 1928	Conviction
Szpala, Frank	Easthampton	Northampton	May 23, 1929	Conviction

MAPLE SUGAR.

[Contained cane sugar other than maple.]

Eliopoulos, Peter	Salem	Salem	Jan. 22, 1929	Conviction
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MAPLE SYRUP.

[Contained cane sugar.]

Bergeron, Rene Paul	Chicopee	Springfield	June 6, 1929	Conviction
Center Lunch, Incorporated	West Roxbury	West Roxbury	May 11, 1929	Conviction
Haranas, Thomas	Framingham	Framingham	June 10, 1929	Conviction ¹
Ideal Lunch & Restaurant Company	Newburyport	Newburyport	Apr. 24, 1929	Conviction
Mandrakos, Peter	Dorchester	Dorchester	July 18, 1929	Conviction
Wong, Harry	Waltham	Waltham	Nov. 27, 1929	Conviction

OLIVE OIL.

[Adulterated with foreign oil.]

Koularis, John	Springfield	Springfield	Apr. 17, 1929	Conviction
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SAUSAGE.

[Contained starch in excess of 2 per cent.]

Caron, Magloire	Fitchburg	Fitchburg	Nov. 27, 1929	Conviction
Stewart, William	South Barre	Barre	Nov. 21, 1929	Conviction
Stringer, Robert	Lowell	Lowell	Nov. 18, 1929	Conviction

SAUSAGE.

[Contained coloring matter.]

Correia, Joseph	South Dartmouth	New Bedford	Mar. 19, 1929	Conviction
Mades, Maurice M.	Boston	Lynn	Oct. 25, 1929	Conviction
Stewart, William	South Barre	Barre	Nov. 21, 1929	Conviction

¹ Appealed.

For Sale of Adulterated or Misbranded Foods Other than Milk and Milk Products — Concluded.

SAUSAGE.

[Contained a compound of sulphur dioxide not properly labeled.]

NAME.	Address.	Court.	Date.	Result.
Corey, George . . .	Lawrence . . .	Lawrence . . .	Oct. 4, 1929	Conviction
Maloo, Wadae . . .	Lawrence . . .	Lawrence . . .	Oct. 4, 1929	Conviction

SCALLOPS.

[Contained added water.]

Great Atlantic & Pacific Tea Company . . .	Brookline . . .	Brookline . . .	Feb. 11, 1929	Conviction
The Massachusetts Mohican Company . . .	Roxbury . . .	Roxbury . . .	Apr. 10, 1929	Conviction

For Sale of Decomposed Food.

EGGS.

First National Stores, Incorporated . . .	Framingham . . .	Framingham . . .	Nov. 13, 1929	Conviction
First National Stores, Incorporated . . .	Framingham . . .	Framingham . . .	Nov. 13, 1929	Conviction

HAMBURG STEAK.

Burg, Joseph . . .	Quincy . . .	Quincy . . .	Dec. 7, 1928	Conviction
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HAM.

Waldorf System, Incorporated . . .	Boston . . .	Boston . . .	Oct. 11, 1929	Conviction
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For Violation of Bakery Law.

Audet Bakery, Incorporated . . .	Salem . . .	Peabody . . .	Apr. 10, 1929	Conviction ¹
Barazian, Manoog . . .	Watertown . . .	Waltham . . .	Mar. 13, 1929	Conviction
Chelengarian, Arsen . . .	Watertown . . .	Waltham . . .	Mar. 13, 1929	Conviction
General Baking Company . . .	Charlestown . . .	Concord . . .	May 24, 1929	Conviction ¹
Hathaway Baking Company . . .	Salem . . .	Lynn . . .	Apr. 9, 1929	Conviction ¹
Hathaway Bakeries, Incorporated . . .	Springfield . . .	Greenfield . . .	June 5, 1929	Conviction ¹
Jigayian, Mibran . . .	Watertown . . .	Waltham . . .	Mar. 13, 1929	Conviction
Kaldusky, Reuben . . .	Dorchester . . .	Dedham . . .	Mar. 14, 1929	Conviction
Lithuanian National Corporation . . .	Lawrence . . .	Lawrence . . .	Mar. 25, 1929	Conviction
Morehouse Baking Company . . .	Lawrence . . .	Lynn . . .	Apr. 9, 1929	Conviction ¹
Ward Baking Company . . .	Cambridge . . .	Lynn . . .	Apr. 9, 1929	Conviction ¹

For Violation of Sanitary Food Law.

Barazian, Manoog . . .	Watertown . . .	Waltham . . .	Mar. 13, 1929	Conviction
Chelengarian, Arsen . . .	Watertown . . .	Waltham . . .	Mar. 13, 1929	Conviction
Jigayian, Mibran . . .	Watertown . . .	Waltham . . .	Mar. 13, 1929	Conviction

False and Misleading Advertising.

BUTTERED POP CORN.

[Contained oleomargarine.]

Pappadopoulos, Anthony . . .	Westfield . . .	Westfield . . .	Aug. 7, 1929	Conviction
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EGGS.

[Sale of eggs which were not fresh as fresh eggs.]

Boyajian, Sarkis . . .	Lowell . . .	Lowell . . .	Nov. 4, 1929	Conviction
Cloverdale Company . . .	Taunton . . .	Taunton . . .	Nov. 12, 1929	Conviction
Corristi, Frank . . .	Arlington . . .	Cambridge . . .	Jan. 8, 1929	Conviction
Daigneau, Harvey H. . .	Lynn . . .	Lynn . . .	Sept. 6, 1929	Conviction
Dakin Company, Incorporated, H. L. . .	Worcester . . .	Worcester . . .	Apr. 26, 1929	Conviction ²
Economy Grocery Stores Company, Inc. . . .	Boston . . .	Boston . . .	Sept. 18, 1929	Conviction
Goldman, Julius . . .	Worcester . . .	Worcester . . .	Jan. 31, 1929	Conviction ¹
Greco, Donato . . .	Lawrence . . .	Lawrence . . .	Oct. 28, 1929	Conviction
Kennally, James A. . .	Lynn . . .	Lynn . . .	Dec. 12, 1928	Conviction
Krazitz, Isadore . . .	Brookline . . .	Brookline . . .	Oct. 17, 1929	Conviction
Lacroix, Albert . . .	Newton . . .	Newton . . .	Jan. 8, 1929	Conviction
Massachusetts Mohican Company . . .	Holyoke . . .	Holyoke . . .	May 14, 1929	Conviction

¹ Appealed.

² Appealed; defendant defaulted in Superior Court June 3, 1929.

False and Misleading Advertising — Concluded.

EGGS — Concluded.

NAME.	Address.	Court.	Date.	Result.
Paszko, George	Holyoke	Holyoke	May 14, 1929	Conviction
Rhodes Brothers Company	Brookline	Brookline	Nov. 26, 1929	Conviction
Spieler, Edward	Methuen	Methuen	Nov. 12, 1929	Conviction
Squatrito, Louis	Lawrence	Lawrence	Nov. 12, 1929	Conviction
Tomasetti, Gregory	Watertown	Waltham	Nov. 14, 1929	Dismissed
Van Dyk Company, James	Springfield	Springfield	Nov. 27, 1929	Conviction
Young, Julius	Lynn	Lynn	Sept. 24, 1929	Conviction
Zuskiewicz, John A.	Southbridge	Southbridge	Nov. 8, 1929	Conviction

MAPLE SYRUP.

Angus, Rena L.	South Yarmouth	Barnstable	Sept. 13, 1929	Conviction
Brydges, Mary E.	Dennis	Harwich	Sept. 20, 1929	Dismissed
Day & Night Lunch, Incorporated	Springfield	Springfield	Aug. 28, 1929	Conviction
Laravier, Louis	Hyannis	Barnstable	Dec. 19, 1928	Discharged
Marinos, Peter	Plymouth	Plymouth	Dec. 11, 1928	Conviction ¹
Pappus, William D.	Quincy	Quincy	Jan. 9, 1929	Conviction
Wentworth Lunch Company	Boston	Boston	Dec. 18, 1928	Discharged

Relative to Sanitation of Food Establishment.

Marston Summer Street Store, Inc.	Boston	Boston	Jan. 10, 1929	Conviction
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Insanitary Conditions in a Pasteurizing Establishment.

Noble, Albert F.	Newton	Boston	Dec. 21, 1928	Conviction
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For Violation of the Laws relative to Cold Storage.

SELLING COLD STORAGE EGGS WITHOUT MARKING THE CONTAINER.

Arena, Patrick	Watertown	Waltham	Feb. 13, 1929	Conviction
Balian, John	Lawrence	Lawrence	Nov. 12, 1929	Conviction
Bazer, Jake	Lynn	Lynn	Dec. 4, 1928	Conviction
Bender, Samuel	Roxbury	Roxbury	Dec. 27, 1928	Conviction
Bouchard, Edward	Salem	Salem	Nov. 22, 1929	Conviction
Boucher, Alfred	West Brookfield	East Brookfield	Jan. 17, 1929	Conviction
Cappalano, Guiseppe	Lawrence	Lawrence	Nov. 12, 1929	Conviction
Chanski, Israel	Salem	Salem	Nov. 22, 1929	Conviction
Contarino, Rosario	Lawrence	Lawrence	Oct. 28, 1929	Conviction
Delude, William	Spencer	East Brookfield	Jan. 17, 1929	Conviction
Di Barba, Salvatore	Lawrence	Lawrence	Nov. 12, 1929	Conviction
Dymon, Walter	Three Rivers	Palmer	Jan. 11, 1929	Conviction
Economy Grocery Company Stores	Quincy	Quincy	Jan. 9, 1929	Conviction
Feldman, Wolf	Lynn	Lynn	Dec. 4, 1928	Conviction
Fichera, Ned	Lawrence	Lawrence	Oct. 28, 1929	Conviction
Fugere, Henry	Ware	Ware	Dec. 19, 1928	Conviction
Gabrs, Stanley	Athol	Athol	Dec. 17, 1928	Conviction
Grotsky, Stanley	Lawrence	Lawrence	Nov. 12, 1929	Conviction
Gula, Joseph	Palmer	Palmer	Jan. 11, 1929	Conviction
Halloran, Patrick J.	Quincy	Quincy	Jan. 9, 1929	Conviction
Herb, Stephen	Lawrence	Lawrence	Dec. 21, 1928	Conviction ¹
Hodes, Samuel	Worcester	Worcester	Nov. 21, 1929	Conviction
Iannucelli, Antonio	Lawrence	Lawrence	Oct. 28, 1929	Conviction
Juszkiewicz, Antonietta	Palmer	Palmer	Jan. 11, 1929	Conviction
Klek, Stanley	Ware	Ware	Nov. 20, 1929	Conviction
Krespane, Lambi	Natick	Natick	Dec. 6, 1928	Conviction
Labuda, Albert	Wilbraham	Palmer	Feb. 8, 1929	Conviction
Laporte, Napoleon	Salem	Salem	Nov. 22, 1929	Conviction
Marzillo, Fred	Watertown	Waltham	Feb. 13, 1929	Conviction
Mazzola, Anthony	Newton	Newton	Feb. 18, 1929	Conviction ²
Monaco, Camille	Waltham	Waltham	Jan. 7, 1929	Conviction
Monahan, Joseph	Waltham	Waltham	Jan. 7, 1929	Conviction
Nersasian, Nelson	Salem	Salem	Nov. 22, 1929	Conviction
Olivo, Dominic	Waltham	Waltham	Jan. 7, 1929	Conviction
Rhodes Brothers Company	Brookline	Brookline	Nov. 26, 1929	Conviction
Rybicki, Felix C.	Salem	Salem	Nov. 22, 1929	Conviction
Salenikas, Charles	Lynn	Lynn	Dec. 4, 1928	Conviction
Smith, Wilfred L.	Arlington	Cambridge	Jan. 8, 1929	Conviction
Sobocinski, Lewis	Salem	Salem	Nov. 22, 1929	Conviction
Soha, Frank	Springfield	Springfield	Feb. 20, 1929	Conviction
Valcourt, Ludger	Lynn	Lynn	Dec. 4, 1928	Conviction
Wancki, John	Thorndike	Palmer	Jan. 11, 1929	Conviction
Weich, Frederick	Malden	Malden	Jan. 8, 1929	Conviction
Whipple, Walter L.	Providence, R. I.	Providence, R. I.	Dec. 28, 1928	Conviction
Zagorski, John	Ware	Ware	Nov. 20, 1929	Conviction
Zinno, John	Lawrence	Lawrence	Oct. 28, 1929	Conviction

¹ Appealed.² Sentence suspended to February 15, 1930.

For Violations of the Laws relative to Slaughtering.

SLAUGHTERING OR AUTHORIZING SLAUGHTERING IN THE ABSENCE OF INSPECTOR.

NAME.	Address.	Court.	Date.	Result.
Davis, Salim	Agawam	Springfield	Nov. 6, 1929	Conviction
Knight, Lester W. . . .	New Braintree	East Brookfield	Aug. 10, 1929	Conviction
Knight, Robert	New Braintree	East Brookfield	Oct. 11, 1929	Discharged
Laveille, Alfred	Chatham	Harwich	Jan. 4, 1929	Conviction
McNally, George	Brockton	Brockton	Aug. 30, 1929	Conviction
Milligan, William	Alford	Great Barrington	July 24, 1929	Conviction
Mix, Charles J. . . .	Pembroke	Plymouth	Feb. 14, 1929	Conviction
Penn, Herman	Greenfield	Greenfield	Aug. 16, 1929	Conviction ¹
Seibelli, Andrew	Southwick	Westfield	Nov. 27, 1929	Conviction
Wawrzyk, Stephen	Wilbraham	Palmer	Apr. 11, 1929	Conviction

AS INSPECTOR OF SLAUGHTERING VIOLATED THE REGULATIONS OF THE DEPARTMENT.

Bates, Charles R. . . .	Pembroke	Plymouth	Feb. 14, 1929	Conviction
Havens, Clarence	New Braintree	East Brookfield	Aug. 10, 1929	Conviction
Post, Charles F. . . .	Alford	Great Barrington	July 24, 1929	Conviction

SHIPPING DISEASED MEAT IN INTERSTATE COMMERCE.

Durham, Charles	Highgate, Vt. . . .	Burlington, Vt. . . .	Mar. 11, 1929	Conviction
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For Violation of the Mattress Laws.

Great Eastern Bedding Company	Roxbury	Roxbury	Oct. 18, 1929	Conviction
National Mattress Company	Boston	Boston	Oct. 27, 1929	Conviction ¹
Rothchild, David (2 counts)	Roxbury	Roxbury	Sept. 17, 1929	Conviction
Shatzman, Abraham	Chelsea	Somerville	Sept. 5, 1929	Conviction

Obstruction of an Inspector.

Reid, James	Raynham	Taunton	Apr. 1, 1929	Conviction ¹
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TABLE 2. — *Summary of Food Statistics.*

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Butter	19	16	35
Canned goods:			
Clams	3	—	3
Fruits	—	1	1
Cider	—	1	1
Clams	18	15	33
Coffee	1	—	1
Confectionery	5	—	5
Corn oil	1	—	1
Corn syrup	1	—	1
Cream	93	4	97
Cream of tartar	1	—	1
Dried fruits	1	10	11
Eggs	188	165	353
Flavoring extracts	31	—	31
Flour	2	—	2
Frozen custard	3	—	3
Honey	2	—	2
Ice cream	12	—	12
Jams and jellies	3	—	3
Maple sugar	12	7	19
Maple syrup	22	26	48
Meat products:			
Frankforts	1	—	1
Ham	—	1	1
Hamburg	25	11	36
Liver	1	1	2
Mince meat	1	—	1
Sausage	468	46	514
Miscellaneous food	10	—	10
Olive oil	38	9	47
Orange juice	1	—	1
Proprietary food	1	—	1
Relishes	2	1	3
Salad dressings	30	—	30
Scallops	11	10	21
Soda water syrup	1	—	1
Soft drinks	7	—	7
Sugar	1	2	3
Tea	—	1	1
Vinegar	55	25	80
	1,073	351	1,424

¹ Appealed.

TABLE 3. — *Summary of Drug Statistics.*

CHARACTER OF SAMPLE.	Genuine.	Adulterated.	Total.
Camphorated oil	19	—	19
Citrate of magnesia	1	—	1
Ether for anaesthesia	23	1	24
Lime water	28	4	32
Proprietary medicine	3	—	3
Spirit of camphor	15	—	15
Spirit of nitrous ether	40	19	59
Spirit of peppermint	4	—	4
Syrup of squill	3	—	3
Tincture of arnica	1	—	1
Tincture of iodine	4	—	4
Wine	1	—	1
	142	24	166

TABLE 4. — *Liquor Report for 1929.**Character of Samples.*

CITIES AND TOWNS.	Beer.	Cider.	Wine.	Distilled Spirits.	Extracts.	Alcohol.	Miscellaneous.	Total.
Belmont	5	—	—	25	—	—	9	39
Beverly	15	—	2	9	—	—	4	30
Boston	335	2	211	1,586	—	365	133	2,632
Braintree	21	—	1	13	—	3	1	39
Cambridge	68	1	42	286	—	39	32	468
Chelsea	50	—	—	56	—	4	1	111
Chicopee	6	—	—	17	—	2	—	25
Dedham	8	—	32	19	—	3	1	63
Everett	16	5	6	32	—	4	—	63
Fall River	7	—	1	19	—	—	—	27
Fitchburg	32	1	13	9	—	5	—	60
Gardner	41	3	6	19	3	10	6	88
Gloucester	16	—	7	26	3	7	—	59
Haverhill	43	4	9	19	—	—	6	81
Lawrence	36	—	7	23	—	8	6	80
Lowell	98	—	13	148	4	11	24	298
Lynn	22	5	23	210	3	37	11	311
Malden	29	—	15	64	1	17	10	136
Newton	1	—	9	13	2	3	1	29
Northampton	4	—	1	15	—	4	1	25
Norwood	7	—	2	15	—	—	7	31
Peabody	12	—	4	28	—	8	1	53
Pittsfield	11	—	5	24	—	2	2	44
Quincy	15	—	20	26	—	14	—	75
Revere	26	—	4	27	—	3	—	60
Salem	27	—	18	39	1	34	2	121
Somerville	10	—	3	66	—	11	14	104
Southbridge	19	—	1	8	—	4	—	32
Springfield	37	—	14	93	—	4	15	163
Waltham	18	—	20	15	—	11	3	67
Wareham	—	1	2	26	—	6	—	35
Watertown	1	—	14	14	—	1	2	32
Webster	24	—	5	31	—	17	6	83
West Springfield	4	—	1	20	—	—	2	27
Westford	3	1	1	17	—	1	5	28
Weymouth	6	—	2	20	—	4	—	32
Woburn	5	1	4	28	—	5	—	43
Department of Public Safety	147	18	49	263	17	24	46	564
Miscellaneous ¹	258	31	111	284	1	53	51	789
Totals	1,483	73	678	3,652	35	724	402	7,047

¹ From 119 towns submitting less than twenty-five samples each.TABLE 5. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1928, to December 1, 1929.*

[Reason for such extension being that goods were in proper condition for further storage.]

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Eggs (mixed)	18,000	Apr. 9, 1928	July 1, 1929	Gersh, Bernard, Co.
Eggs (mixed)	2,200	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.
Eggs (mixed)	3,432	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.
Eggs (mixed)	6,600	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.
Eggs (mixed)	11,000	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.
Eggs (mixed)	77,616	Aug. 18, 1928	Jan. 17, 1930	Swift & Co.
Egg whites	150	June 29, 1928	July 29, 1929	Fleishman, P.
Egg whites	3,000	June 29, 1928	July 31, 1929	Gersh, Bernard, Co.
Egg whites	6,107	Apr. 4, 1928	June 4, 1929	Keith, H. J., Co.
Egg whites	440	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.

TABLE 5. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1928, to December 1, 1929 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Egg whites	572	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.
Egg whites	4,400	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.
Egg whites	14,280	Apr. 9, 1928	Sept. 1, 1929	Swift & Co.
Egg yolks	100	July 17, 1928	Aug. 17, 1929	Keith, H. J., Co.
Egg yolks	704	May 1928	Sept. 1, 1929	Layton, The John, Co., Inc.
Broilers	234	July 7, 1928	Sept. 6, 1929	Bartlett, Varney & Co.
Broilers	300	July 7, 1928	Sept. 6, 1929	Bartlett, Varney & Co.
Broilers	200	June 5, 1928	July 15, 1929	Thorndike & Gerrish Co.
Broilers	700	June 5, 1928	July 15, 1929	Thorndike & Gerrish Co.
Broilers	840	June 5, 1928	July 15, 1929	Thorndike & Gerrish Co.
Broilers	120	June 12, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Broilers	200	June 16, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Broilers	220	June 26, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Broilers	260	June 26, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Broilers	120	June 30, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Broilers	180	June 30, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Broilers	260	June 30, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Broilers	720	June 30, 1928	Aug. 1, 1929	Thorndike & Gerrish Co.
Chickens	4,339	Sept. 24, 1928	Nov. 25, 1929	Batchelder & Snyder Co.
Chickens	1,345	Nov. 16, 1928	Feb. 16, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Chickens (guinea)	4,104	Dec. 1, 1928	Mar. 1, 1930	Lamson & Co.
Turkeys	3,350	Nov. 29, 1927	Dec. 29, 1928	Bartlett, Varney & Co.
Turkeys	4,500	Dec. 9, 1927	Mar. 9, 1929	Bartlett, Varney & Co.
Turkeys	2,780	Feb. 17, 1928	Apr. 17, 1929	Berman & Co., Inc.
Turkeys	600	Feb. 13, 1928	Apr. 13, 1929	Goodenough & Russell
Turkeys	1,000	Feb. 13, 1928	Apr. 13, 1929	Goodenough & Russell
Turkeys	695	Dec. 5, 1927	Mar. 5, 1929	Hosmer, F. H., & Co.
Turkeys	1,452	Dec. 5, 1927	Mar. 5, 1929	Hosmer, F. H., & Co.
Turkeys	1,519	Dec. 5, 1927	Mar. 5, 1929	Hosmer, F. H., & Co.
Turkeys	1,861	Dec. 5, 1927	Mar. 5, 1929	Hosmer, F. H., & Co.
Turkeys	4,080	Dec. 5, 1927	Mar. 5, 1929	Hosmer, F. H., & Co.
Turkeys	12,807	Dec. 5, 1927	Mar. 5, 1929	Hosmer, F. H., & Co.
Turkeys	4,497	Dec. 21, 1927	Mar. 20, 1929	Hosmer, F. H., & Co.
Turkeys	789	Dec. 23, 1927	Mar. 23, 1929	Hosmer, F. H., & Co.
Turkeys	10,889	Dec. 26, 1927	Mar. 26, 1929	Hosmer, F. H., & Co.
Turkeys	14,645	Dec. 26, 1927	Mar. 26, 1929	Hosmer, F. H., & Co.
Turkeys	1,073	Dec. 27, 1927	Mar. 27, 1929	Hosmer, F. H., & Co.
Turkeys	1,445	Dec. 27, 1927	Mar. 27, 1929	Hosmer, F. H., & Co.
Turkeys	2,507	Dec. 27, 1927	Mar. 27, 1929	Hosmer, F. H., & Co.
Turkeys	1,389	Dec. 28, 1927	Mar. 28, 1929	Hosmer, F. H., & Co.
Turkeys	922	Dec. 29, 1927	Mar. 29, 1929	Hosmer, F. H., & Co.
Turkeys	1,039	Dec. 29, 1927	Mar. 29, 1929	Hosmer, F. H., & Co.
Turkeys	2,408	Dec. 29, 1927	Mar. 29, 1929	Hosmer, F. H., & Co.
Turkeys	7,164	Dec. 29, 1927	Mar. 29, 1929	Hosmer, F. H., & Co.
Turkeys	1,491	Dec. 30, 1927	Mar. 30, 1929	Hosmer, F. H., & Co.
Turkeys	1,607	Dec. 30, 1927	Mar. 30, 1929	Hosmer, F. H., & Co.
Turkeys	890	Sept. 1928 ¹	Sept. 1, 1929	Lamson & Co.
Turkeys	3,619	Sept. 1928 ¹	Sept. 1, 1929	Lamson & Co.
Turkeys	3,400	Dec. 1, 1928	Mar. 1, 1930	Lamson & Co.
Turkeys	3,900	Dec. 1, 1928	Mar. 1, 1930	Lamson & Co.
Turkeys	8,000	Dec. 1, 1928	Mar. 1, 1930	Lamson & Co.
Turkeys	9,400	Dec. 1, 1928	Mar. 1, 1930	Lamson & Co.
Turkeys	18,900	Dec. 1, 1928	Mar. 1, 1930	Lamson & Co.
Venison	45	Nov. 7, 1928	Feb. 1, 1930	Davis, Fred E.
Beef livers	15,300	Oct. 16, 1928	Jan. 16, 1930	Baneroft, George, & Co.
Beef livers	27,000	Aug. 22, 1928	Nov. 22, 1929	C & T Co.
Beef livers	11,000	Nov. 11, 1928	Jan. 14, 1930	Gray, P. G., Co.
Beef livers	33,000	Aug. 27, 1928	Dec. 3, 1929	Warden, Charles F.
Beef loins	6,700	Mar. 31, 1928	July 31, 1929	Doe, William A., Co.
Beef loins	6,558	May 9, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,181	May 11, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,195	May 11, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,219	May 16, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	2,037	May 17, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,053	May 18, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	4,936	May 25, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	2,635	May 29, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	473	June 8, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,051	June 8, 1928	Aug. 31, 1929	Swift & Co.
Beef loins	1,671	June 8, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	2,993	June 14, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	3,039	June 14, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,141	June 25, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	3,240	July 3, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	3,479	July 17, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	756	July 20, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,358	July 20, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	2,547	July 20, 1928	Sept. 14, 1929	Swift & Co.
Beef loins	1,594	July 21, 1928	Sept. 14, 1929	Swift & Co.
Lamb	8,581	Oct. 11, 1928	Jan. 7, 1930	Armour & Co.
Lamb	21,456	Oct. 11, 1928	Jan. 7, 1930	Armour & Co.

¹ Imported, received frozen and undated.

TABLE 5. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1928, to December 1, 1929 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Pork	2,512	June 8, 1928	July 8, 1929	Wattendorf & Feeney
Pork	14,700	Dec. 15, 1927	Jan. 15, 1929	Cornellier, J. N.
Bluefish	260	Aug. 4, 1928	Dec. 4, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Bluefish	1,100	Aug. 17, 1928	Dec. 17, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Bluefish	1,900	June 9, 1928	Dec. 9, 1929	Foley, M. F.
Bluefish	1,519	July 26, 1928	Dec. 26, 1929	Whitman, Ward & Lee Co.
Eels (sand)	1,155	May 16, 1928	Nov. 30, 1929	Busalacchi Brothers
Eels (sand)	2,000	May 16, 1928	Nov. 16, 1929	Busalacchi, T. & J.
Eels (sand)	525	May 4, 1928	Nov. 3, 1929	Mantia, S., & Co.
Eels (sand)	200	June 15, 1928	Dec. 15, 1929	Mantia, S., & Co.
Eels (sand)	350	June 29, 1928	Dec. 29, 1929	Mantia, S., & Co.
Eels	140	July 2, 1928	Jan. 1, 1930	Mantia, S., & Co.
Eels	95	July 11, 1928	Jan. 11, 1930	Mantia, S., & Co.
Eels	100	July 20, 1928	Dec. 24, 1929	Mantia, S., & Co.
Eels	80	July 25, 1928	Dec. 24, 1929	Mantia, S., & Co.
Eels	2,100	Aug. 15, 1928	Jan. 2, 1930	Mantia, S., & Co.
Eels (sand)	390	Sept. 24, 1928	Jan. 3, 1930	Mantia, S., & Co.
Eels (sand)	3,150	Oct. 10, 1928	Jan. 10, 1930	Rowe & Sullivan
Eels (sand)	3,689	Oct. 10, 1928	Jan. 10, 1930	Rowe & Sullivan
Eels (sand)	7,199	Oct. 10, 1928	Jan. 10, 1930	Rowe & Sullivan
Eels (sand)	1,742	Oct. 10, 1928	Jan. 10, 1930	Tribuna & Magri Co.
Flounders ¹	800	Apr. 7, 1928	July 7, 1929	Atlantic & Pacific Fish Co.
Flounders ¹	2,599	Apr. 7, 1928	July 7, 1929	Atlantic & Pacific Fish Co.
Flounders	730	Nov. 22, 1928	Feb. 1, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Flounders ¹	5,795	May 7, 1928	Nov. 18, 1929	Whitman, Ward & Lee Co.
Flounders ¹	4,252	May 18, 1928	Nov. 18, 1929	Whitman, Ward & Lee Co.
Haddock	800	May 9, 1928	June 16, 1929	Arrington, H. R.
Haddock	1,500	Oct. 25, 1928	Nov. 25, 1929	Best Fish Co.
Hake (fillets)	1,760	July 25, 1928	Oct. 25, 1929	Russo & Sons
Hake (fillets)	270	Sept. 6, 1928	Jan. 1, 1930	Russo & Sons
Hake (fillets)	2,544	Oct. 25, 1928	Jan. 1, 1930	Russo & Sons
Halibut	10,806	Oct. 25, 1928	Jan. 25, 1930	Atlantic Halibut Co.
Halibut	7,200	Oct. 27, 1928	Jan. 27, 1930	Atlantic Halibut Co.
Halibut	7,800	Oct. 27, 1928	Jan. 27, 1930	Atlantic Halibut Co.
Halibut	2,213	Oct. 26, 1928	Jan. 26, 1930	Atlantic & Pacific Fish Co.
Halibut	1,200	July 13, 1928	Jan. 15, 1930	Atlantic & Pacific Tea Co. (The Great)
Halibut	5,514	Nov. 1, 1928	Feb. 1, 1930	Atlantic & Pacific Tea Co. (The Great)
Halibut	16,517	Nov. 1, 1928	Feb. 1, 1930	Atlantic & Pacific Tea Co. (The Great)
Halibut	15,051	Nov. 2, 1928	Feb. 2, 1930	Atlantic & Pacific Tea Co. (The Great)
Halibut	331	Mar. 6, 1929 ²	Dec. 15, 1929	Atlantic & Pacific Tea Co. (The Great)
Halibut	585	July 3, 1928	Sept. 15, 1929	Atlas Fish Co.
Halibut	641	July 3, 1928	Nov. 15, 1929	Atlas Fish Co.
Halibut	1,055	Aug. 8, 1928	Dec. 8, 1929	Best Fish Co.
Halibut	126	Oct. 8, 1928	Dec. 8, 1929	Best Fish Co.
Halibut	555	July 9, 1928	Jan. 9, 1930	Booth Fisheries Co.
Halibut	840	July 13, 1928	Jan. 13, 1930	Booth Fisheries Co.
Halibut	785	Aug. 11, 1928	Dec. 11, 1929	Booth Fisheries Co.
Halibut	325	June 21, 1928	Dec. 21, 1929	Burns, McKeon Co.
Halibut	125	July 19, 1928	Dec. 31, 1929	Burns, McKeon Co.
Halibut	550	July 20, 1928	Dec. 31, 1929	Burns, McKeon Co.
Halibut	125	Aug. 16, 1928	Feb. 16, 1930	Burns, McKeon Co.
Halibut	1,070	Aug. 31, 1928	Dec. 30, 1929	Burns, McKeon Co.
Halibut	558	Oct. 10, 1928	Jan. 10, 1930	Burns, McKeon Co.
Halibut	1,028	Apr. 15, 1928	Sept. 15, 1929	Coleman Son Co.
Halibut	1,169	Apr. 27, 1928	June 29, 1929	Foley, M. F.
Halibut	2,202	Sept. 19, 1928	Dec. 19, 1929	Harding, F. E., Co.
Halibut	197	Oct. 22, 1928	Dec. 22, 1929	Harding, F. E., Co.
Halibut	3,750	Aug. 9, 1928	Feb. 10, 1930	New England Fish Co.
Halibut	1,600	Aug. 10, 1928	Dec. 10, 1929	New England Fish Co.
Halibut	4,100	Aug. 20, 1928	Jan. 20, 1930	New England Fish Co.
Halibut	1,590	Oct. 20, 1928	Dec. 25, 1929	New England Fish Co.
Halibut	8,650	Oct. 20, 1928	Dec. 20, 1929	New England Fish Co.
Halibut	2,100	Apr. 12, 1928	June 12, 1929	Phillips, B. F., Co.
Halibut	1,500	Apr. 15, 1928	June 15, 1929	Phillips, B. F., Co.
Halibut	1,900	Sept. 19, 1928	Dec. 19, 1929	Prior, P. H., Co.
Halibut	1,922	Oct. 20, 1928	Jan. 20, 1930	Prior & Townsend, Inc.
Halibut	15,738	Nov. 5, 1928	Jan. 5, 1930	Rich, Joseph A., Co.
Halibut	495	Apr. 4, 1929 ²	Nov. 15, 1929	Snow & Parker, Inc.
Halibut	200	Aug. 15, 1928	Dec. 15, 1929	Standard Fish Co.
Halibut	1,000	Sept. 7, 1928	Jan. 1, 1930	Ward Fisheries, Inc.
Halibut	800	Oct. 10, 1928	Dec. 20, 1929	Ward Fisheries, Inc.
Halibut	1,596	Oct. 20, 1928	Dec. 20, 1929	Ward Fisheries, Inc.
Halibut	2,000	June 28, 1928	Oct. 28, 1929	Whitman, Ward & Lee Co.
Halibut	800	July 3, 1928	Dec. 3, 1929	Whitman, Ward & Lee Co.

¹ Bait.² Received frozen and undated.

TABLE 5. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1928, to December 1, 1929 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Halibut	4,000	Aug. 6, 1928	Dec. 6, 1929	Whitman, Ward & Lee Co.
Halibut	3,714	Nov. 2, 1928	Jan. 2, 1930	Whitman, Ward & Lee Co.
Herring (sardine)	1,221	June 23, 1928	Dec. 31, 1929	Schneider's Fish & Oyster Market
Mackerel	1,472	July 6, 1928	Dec. 31, 1929	Adams, J., & Co., Inc.
Mackerel	1,322	July 21, 1928	Dec. 31, 1929	Adams, J., & Co., Inc.
Mackerel	3,000	Aug. 25, 1928	Dec. 31, 1929	Adams, J., & Co., Inc.
Mackerel	10,780	Aug. 1, 1928	Jan. 1, 1930	Atlantic & Pacific Fish Co.
Mackerel	5,460	Oct. 6, 1928	Jan. 6, 1930	Atlantic & Pacific Fish Co.
Mackerel	2,150	June 4, 1928	Dec. 5, 1929	Batchelder & Snyder Co.
Mackerel	2,317	June 22, 1928	Dec. 23, 1929	Batchelder & Snyder Co.
Mackerel	14,962	June 23, 1928	Dec. 23, 1929	Batchelder & Snyder Co.
Mackerel	725	May 25, 1928	Nov. 25, 1929	Burns, McKeon Co.
Mackerel	1,600	May 31, 1928	Nov. 31, 1929	Burns, McKeon Co.
Mackerel	5,200	June 9, 1928	Dec. 9, 1929	Burns, McKeon Co.
Mackerel	1,500	June 21, 1928	Dec. 21, 1929	Burns, McKeon Co.
Mackerel	2,200	June 23, 1928	Dec. 23, 1929	Burns, McKeon Co.
Mackerel	750	July 23, 1928	Dec. 31, 1929	Burns, McKeon Co.
Mackerel	2,500	Aug. 11, 1928	Dec. 11, 1929	Burns, McKeon Co.
Mackerel	5,275	Aug. 21, 1928	Dec. 21, 1929	Burns, McKeon Co.
Mackerel	1,885	Oct. 6, 1928	Jan. 6, 1930	Burns, McKeon Co.
Mackerel	600	Nov. 30, 1928	Jan. 30, 1930	Cape Fish Co.
Mackerel	13,691	June 15, 1928	Dec. 15, 1929	Commonwealth Fish Co.
Mackerel	6,295	June 18, 1928	Dec. 18, 1929	Commonwealth Fish Co.
Mackerel ¹	14,161	July 25, 1928	Jan. 22, 1930	Commonwealth Ice & Cold Storage Co.
Mackerel	11,569	June 11, 1928	Dec. 11, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel	15,316	June 13, 1928	Dec. 13, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel	9,630	June 14, 1928	Jan. 31, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel	11,809	June 15, 1928	Dec. 15, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel (fillets)	6,882	June 19, 1928	Jan. 31, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel (fillets)	325	July 18, 1928	Dec. 28, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel (fillets)	550	July 18, 1928	Dec. 28, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel	3,100	July 23, 1928	Dec. 23, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel	15,000	July 23, 1928	Jan. 31, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel (fillets)	140	Aug. 4, 1928	Dec. 4, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel ¹	2,700	June 23, 1928	Dec. 23, 1929	Fitch, Warren, Co.
Mackerel	2,550	July 27, 1928	Dec. 31, 1929	Fitch, Warren, Co.
Mackerel	3,316	July 28, 1928	Dec. 31, 1929	Fitch, Warren, Co.
Mackerel	1,955	Sept. 30, 1928	Dec. 30, 1929	Freeman & Cobb Co.
Mackerel (fillets)	468	June 20, 1928	Oct. 22, 1929	General Seafoods Corporation
Mackerel (fillets)	4,197	July 2, 1928	Oct. 22, 1929	General Seafoods Corporation
Mackerel (fillets)	1,686	July 3, 1928	Oct. 22, 1929	General Seafoods Corporation
Mackerel (fillets)	3,658	July 5, 1928	Oct. 22, 1929	General Seafoods Corporation
Mackerel (fillets)	1,283	July 6, 1928	Oct. 22, 1929	General Seafoods Corporation
Mackerel ¹	1,019	June 26, 1928	Sept. 26, 1929	Harding, F. E., Co.
Mackerel ¹	2,550	June 28, 1928	Sept. 28, 1929	Harding, F. E., Co.
Mackerel	450	June 13, 1928	Dec. 13, 1929	Mantia, S., & Co.
Mackerel	800	June 14, 1928	Dec. 14, 1929	Mantia, S., & Co.
Mackerel	2,100	June 14, 1928	Dec. 14, 1929	Mantia, S., & Co.
Mackerel	1,650	June 16, 1928	Dec. 16, 1929	Mantia, S., & Co.
Mackerel	320	Aug. 29, 1928	Jan. 2, 1930	Mantia, S., & Co.
Mackerel	1,950	Aug. 29, 1928	Jan. 2, 1930	Mantia, S., & Co.
Mackerel	1,620	June 19, 1928	Feb. 1, 1930	O'Brien, W. H.
Mackerel	500	Oct. 10, 1928	Jan. 1, 1930	O'Hara Brothers Co., Inc.
Mackerel	6,000	Oct. 10, 1928	Jan. 1, 1930	O'Hara Brothers Co., Inc.
Mackerel	6,000	Oct. 25, 1928	Jan. 25, 1930	O'Hara Brothers Co., Inc.
Mackerel	2,500	Oct. 28, 1928	Jan. 28, 1930	O'Hara Brothers Co., Inc.
Mackerel	3,300	Oct. 28, 1928	Jan. 28, 1930	O'Hara Brothers Co., Inc.
Mackerel	300	Oct. 6, 1928	Jan. 6, 1930	Pier Fish Co.
Mackerel	6,915	Oct. 6, 1928	Jan. 6, 1930	Pier Fish Co.
Mackerel	6,432	Oct. 16, 1928	Jan. 16, 1930	Pier Fish Co.
Mackerel	2,710	July 17, 1928	Dec. 27, 1929	Rich, E. A., Co.
Mackerel	680	July 16, 1928	Dec. 16, 1929	Rowe & Sullivan
Mackerel	750	July 21, 1928	Dec. 21, 1929	Rowe & Sullivan
Mackerel	600	Aug. 10, 1928	Feb. 10, 1930	Rowe & Sullivan
Mackerel	3,000	May 18, 1928	Dec. 18, 1929	Schermerhorn Fish Co.
Mackerel	1,460	June 27, 1928	Dec. 31, 1929	Schneider's Fish & Oyster Market
Mackerel	750	June 18, 1928	Aug. 18, 1929	Smith, D. D.
Mackerel	180	May 28, 1928	Dec. 1, 1929	Tocco, Joe
Mackerel	1,620	June 13, 1928	Dec. 31, 1929	Tocco, Joe

TABLE 5. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1928, to December 1, 1929 — Continued.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Mackerel	3,600	June 14, 1928	Dec. 31, 1929	Tocco, Joe
Mackerel	2,070	June 15, 1928	Dec. 31, 1929	Tocco, Joe
Mackerel	990	June 29, 1928	Dec. 31, 1929	Tocco, Joe
Mackerel	330	June 30, 1928	Dec. 31, 1929	Tocco, Joe
Pollock	885	Aug. 24, 1928	Dec. 30, 1929	Best Fish Co.
Pollock	2,399	Nov. 3, 1928	Feb. 3, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Pollock	1,241	Nov. 19, 1928	Feb. 1, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Pollock	2,813	Nov. 20, 1928	Feb. 1, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Pollock	2,225	Nov. 23, 1928	Feb. 1, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Salmon	2,200	Oct. 17, 1928	Jan. 17, 1930	Atlantic & Pacific Tea Co. (The Great)
Salmon	3,000	June 9, 1928	July 9, 1929	Batchelder & Snyder Co.
Salmon	669	Aug. 31, 1928	Dec. 31, 1929	Burns, McKeon Co.
Salmon	200	Aug. 17, 1928	Nov. 17, 1929	Commonwealth Ice & Cold Storage Co.
Salmon	2,000	Nov. 1, 1928	Feb. 1, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Salmon	9,200	Nov. 1, 1928	Feb. 1, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Salmon	800	Oct. 25, 1928	Dec. 15, 1929	New England Fish Co.
Salmon (fillets)	4,920	Aug. 25, 1928	Dec. 25, 1929	O'Hara Brothers Fillets Co.
Scallops	1,512	Oct. 15, 1928	Jan. 15, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Scallops	960	Oct. 18, 1928	Jan. 18, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Scallops	472	Oct. 19, 1928	Jan. 19, 1930	First National Stores, Inc. (Arthur E. Dorr Division)
Scup	7,400	May 23, 1928	Nov. 23, 1929	Coggeshall Brothers
Scup	565	May 25, 1928	Nov. 25, 1929	Coggeshall Brothers
Scup	6,000	May 11, 1928	Nov. 30, 1929	Corso & Gambino Co.
Scup	3,900	May 23, 1928	Nov. 30, 1929	Corso & Gambino Co.
Shad roe	135	June 23, 1928	Dec. 23, 1929	Burns, McKeon Co.
Shrimp	500	Nov. 11, 1928	Feb. 22, 1930	Foley, M. F., Co.
Smelts	2,600	Oct. 26, 1928	Jan. 26, 1930	Atlantic & Pacific Fish Co.
Sole	1,500	Aug. 31, 1928	Dec. 31, 1929	Burns, McKeon Co.
Sole	4,400	May 5, 1928	Nov. 5, 1929	Burns, McKeon Co.
Sole	1,500	May 22, 1928	Nov. 5, 1929	Burns, McKeon Co.
Sole	4,000	Oct. 31, 1928	Jan. 31, 1930	Burns, McKeon Co.
Squid	4,165	May 21, 1928	Nov. 21, 1929	Boston Fish Market
Squid (bone)	9,660	May 8, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	19,710	May 9, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	11,820	May 11, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	4,920	May 12, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	5,550	May 12, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	12,240	May 12, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	7,860	May 14, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	15,480	May 15, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid	32,220	May 17, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid	11,610	May 18, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid	5,250	May 23, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid	7,050	May 26, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid	10,350	May 26, 1928	Nov. 30, 1929	Busalacchi Brothers
Squid (bone)	20,550	June 1, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid (bone)	17,610	June 2, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid (bone)	19,200	June 2, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid (bone)	10,500	June 7, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid (bone)	10,700	June 10, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid (bone)	23,900	June 12, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid (bone)	10,400	June 14, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid	1,000	June 15, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid	7,000	June 15, 1928	Dec. 31, 1929	Busalacchi Brothers
Squid	30,000	May 1928	Nov. 30, 1929	Consolidated Weir Co.
Squid (bone)	1,020	June 1, 1928	Dec. 31, 1929	Covino, Joseph
Squid (bone)	1,800	June 2, 1928	Dec. 31, 1929	Covino, Joseph
Squid (bone)	275	May 5, 1928	Nov. 4, 1929	Mantia, S., & Co.
Squid (bone)	5,000	May 7, 1928	Nov. 6, 1929	Mantia, S., & Co.
Squid (bone)	6,300	May 9, 1928	Nov. 8, 1929	Mantia, S., & Co.
Squid	13,725	May 11, 1928	Nov. 10, 1929	Mantia, S., & Co.
Squid (bone)	11,250	May 12, 1928	Nov. 11, 1929	Mantia, S., & Co.
Squid	175	May 14, 1928	Nov. 13, 1929	Mantia, S., & Co.
Squid	175	May 16, 1928	Nov. 15, 1929	Mantia, S., & Co.
Squid	1,750	May 17, 1928	Nov. 16, 1929	Mantia, S., & Co.
Squid	250	May 18, 1928	Nov. 14, 1929	Mantia, S., & Co.
Squid	300	May 21, 1928	Nov. 20, 1929	Mantia, S., & Co.
Squid	10,800	May 25, 1928	Nov. 24, 1929	Mantia, S., & Co.
Squid	6,800	June 12, 1928	Dec. 12, 1929	Mantia, S., & Co.
Squid	1,020	June 22, 1928	Dec. 22, 1929	Mantia, S., & Co.
Squid	850	June 29, 1928	Dec. 29, 1929	Mantia, S., & Co.
Squid	100,424	May 10, 1928	Dec. 10, 1929	Parker Fish Freezer Co.

TABLE 5. — *Requests for Extension of Time granted on Goods in Cold Storage from December 1, 1928, to December 1, 1929 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Extension granted to —	Name.
Squid	9,600	May 8, 1928	Sept. 8, 1929	Russo & Sons
Squid	9,135	May 11, 1928	Oct. 11, 1929	Russo & Sons
Squid	900	May 14, 1928	Sept. 14, 1929	Russo & Sons
Squid	6,100	May 14, 1928	Sept. 14, 1929	Russo & Sons
Squid	4,050	May 22, 1928	Sept. 22, 1929	Russo & Sons
Squid	1,950	May 26, 1928	Sept. 26, 1929	Russo & Sons
Squid	3,250	May 31, 1928	Sept. 30, 1929	Russo & Sons
Squid	6,890	May 9, 1928	Nov. 30, 1929	Tocco, Joe
Squid	4,096	May 23, 1928	Dec. 1, 1929	Tocco, Joe
Squid	4,192	May 25, 1928	Dec. 1, 1929	Tocco, Joe
Squid	6,345	May 28, 1928	Dec. 1, 1929	Tocco, Joe
Squid	10,944	May 31, 1928	Dec. 1, 1929	Tocco, Joe
Squid	2,970	June 4, 1928	Dec. 15, 1929	Tocco, Joe
Squid	9,152	June 14, 1928	Dec. 31, 1929	Tocco, Joe
Squid (bone)	5,900	May 7, 1928	July 7, 1929	Tribuna & Magri Co.
Squid	600	June 9, 1928	Dec. 8, 1929	Zizzo, F. & L., Co.
Swordfish	2,286	Aug. 21, 1928	Dec. 21, 1929	First National Stores, Inc. (Arthur E. Dorr Division)
Weakfish	330	May 26, 1928	Aug. 25, 1929	Goley, M. F.
Whiting (skinned)	32,000	Aug. 1, 1928	Mar. 1, 1930	Gloucester Cold Storage & Warehouse Co.
Whiting	950	June 25, 1928	Dec. 24, 1929	Mantia, S., & Co.
Whiting	1,070	June 28, 1928	Dec. 28, 1929	Mantia, S., & Co.
Whiting	550	July 5, 1928	Jan. 5, 1930	Mantia, S., & Co.
Whiting	1,250	July 13, 1928	Jan. 12, 1930	Mantia, S., & Co.
Whiting	3,800	July 16, 1928	Jan. 15, 1930	Mantia, S., & Co.
Whiting	1,325	July 18, 1928	Jan. 18, 1930	Mantia, S., & Co.
Whiting	3,075	July 19, 1928	Jan. 19, 1930	Mantia, S., & Co.
Whiting	1,925	July 26, 1928	Jan. 26, 1930	Mantia, S., & Co.
Whiting	3,600	June 11, 1928	Dec. 31, 1929	Tribuna & Magri Co.
Whiting	10,670	June 19, 1928	Jan. 18, 1930	Tribuna & Magri Co.
Whiting	4,708	July 10, 1928	Jan. 10, 1930	Tribuna & Magri Co.
Whiting	8,524	July 14, 1928	Jan. 14, 1930	Tribuna & Magri Co.
Whiting	5,940	July 19, 1928	Jan. 17, 1930	Tribuna & Magri Co.
Whiting	4,376	July 23, 1928	Jan. 23, 1930	Tribuna & Magri Co.

TABLE 6. — *Requests for Extension of Time not granted on Goods in Cold Storage from December 1, 1928, to December 1, 1929.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Egg whites	1,080	May 31, 1927	Fleishman, P.
Turkeys	849	Dec. 29, 1927	Hosmer, F. H., & Co.
Beef tenderloins	800	Nov. 6, 1928	Mades, M. M., Co.
Beef tenderloins	4,000	Nov. 6, 1928	Mades, M. M., Co.
Beef tenderloins	6,000	Nov. 6, 1928	Mades, M. M., Co.
Beef tenderloins	400	Nov. 7, 1928	Mades, M. M., Co.
Beef tenderloins	500	Nov. 7, 1928	Mades, M. M., Co.
Beef tenderloins	600	Nov. 24, 1928	Mades, M. M., Co.
Calves' livers	10,918	June 2, 1928	Batchelder & Snyder Co.
Calves' livers	21,508	July 10, 1928	Batchelder & Snyder Co.
Pork loins	1,680	Dec. 15, 1927	Cornellier, J. N.
Pork loins	2,700	Dec. 21, 1927	Cornellier, J. N.
Bass (sea)	193	May 21, 1928	Prior & Townsend, Inc.
Hake (fillets)	1,800	Aug. 1, 1928	Russo & Sons
Halibut	47	Mar. 9, 1929 ¹	Atlantic & Pacific Tea Co. (The Great)
Halibut	2,400	Aug. 15, 1928	Booth Fisheries Co.
Halibut	600	Oct. 11, 1928	Booth Fisheries Co.
Mackerel	150	Aug. 4, 1928	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel	1,350	Aug. 4, 1928	First National Stores, Inc. (Arthur E. Dorr Division)
Mackerel	1,950	Sept. 26, 1928	First National Stores, Inc. (Arthur E. Dorr Division)
Salmon	270	Nov. 22, 1928	Cape Fish Co.
Scallops	880	Dec. 30, 1927	Gifford, Charles H.
Scallops	1,280	Oct. 19, 1928	First National Stores, Inc. (Arthur E. Dorr Division)
Shark	200	June 9, 1928	Zizzo, F. & L., Co.
Squid	300	May 28, 1928	Russo & Sons
Squid	780	May 31, 1928	Russo & Sons
Squid	2,000	May 31, 1928	Russo & Sons

¹ Received frozen and undated.

TABLE 7. — *Articles which had been in Cold Storage Longer than Twelve Months and on which no Requests for Extensions had been made ordered removed from December 1, 1928, to December 1, 1929.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Butter	30	Aug. 15, 1928	Worcester State Normal School
Eggs (mixed)	400	Oct. 1, 1927	Layton, The John, Co., Inc.
Egg whites	600	July 31, 1928	Holbrook Grocery Co.
Egg whites	240	Apr. 3, 1928	Keith, H. J., Co.
Egg whites	800	Oct. 1, 1927	Layton, The John, Co., Inc.
Broilers	54	July 11, 1928	Holmes, Samuel, Inc.
Broilers	528	July 6, 1928	Thorndike & Gerrish Co.
Broilers	462	July 16, 1928	Thorndike & Gerrish Co.
Broilers	253	July 18, 1928	Thorndike & Gerrish Co.
Broilers	369	July 18, 1928	Thorndike & Gerrish Co.
Chickens	300	Dec. 27, 1927	Childs, Sleeper Co.
Ducks	76	Sept. 11, 1928	Hosmer, F. H., & Co.
Fowl	515	Mar. 13, 1928	Armour & Co.
Fowl	507	Nov. 28, 1927	Towle & Hilliard
Fowl	40	May 22, 1928	Van Dyke, James, Co.
Fowl	500	Nov. 11, 1927	Waldorf System, Inc.
Poultry	49	July 23, 1928	Hosmer, F. H., & Co.
Turkeys	900	Dec. 30, 1927	Lawrence, H. L., Co.
Bear	71	Oct. 4, 1928	Hicks & Shaw, Inc.
Deer	150	Nov. 14, 1927	Hance, F. W.
Deer meat	20	Dec. 17, 1927	Senter, C. H.
Beef livers	63	June 8, 1928	Mindick, M., Co.
Beef livers	329	July 9, 1928	Mindick, M., Co.
Beef livers	220	July 19, 1928	Mindick, M., Co.
Beef livers	100	July 26, 1928	Mindick, M., Co.
Beef livers	50	Aug. 29, 1928	Mindick, M., Co.
Beef tenderloins	92	July 28, 1928	Childs, Sleeper Co.
Beef tenderloins	150	Sept. 8, 1928	Swift & Co.
Lamb	772	Oct. 6, 1928	First National Stores, Inc. (Arthur E. Dorr Division)
Lamb	633	May 22, 1928	Winthrop Arms Hotel
Pork	98	May 17, 1928	Kirby, Dr. Holder C.
Pork	1,450	Nov. 29, 1927	Quigley, M. J.
Pork loins	2,500	Apr. 11, 1929 ¹	Armour & Co.
Pork loins	2,250	Jan. 12, 1928	Shea, D. J.
Pork neck bones	300	Oct. 25, 1928	Sweet, A.
Pork trimmings	300	Feb. 15, 1928	Eastern Provision Co.
Sweet breads	170	June 20, 1928	Childs, Sleeper Co.
Sweet breads	10	Aug. 1, 1928	Fellows, Gamage Co.
Bluefish	1,256	Sept. 1, 1928	Whitman, Ward & Lee Co.
Butterfish	18	June 26, 1928	Foley, M. F., Co.
Cod (market)	4,500	Sept. 27, 1928	Whitman, Ward & Lee Co.
Eels (sand)	2,580	June 6, 1928	Busalacchi Brothers
Eels (sand)	1,200	Dec. 13, 1927	Tocco, Joe
Eels (sand)	70	Sept. 18, 1928	Tocco, Joe
Eels (sand)	75	Sept. 22, 1928	Tocco, Joe
Haddock (fillets)	300	Sept. 11, 1928	Baltimore Fish & Oyster Co.
Haddock (fillets)	150	Oct. 10, 1928	Baltimore Fish & Oyster Co.
Haddock	2,820	Sept. 7, 1928	Schneider's Fish & Oyster Co.
Haddock (scrod)	3,514	Sept. 15, 1928	Whitman, Ward & Lee Co.
Halibut	105	Aug. 31, 1928	Atlas Fish Co.
Halibut	110	Sept. 31, 1928	Atlas Fish Co.
Halibut	300	June 1, 1928	Freeman & Cobb Co.
Halibut	78	Aug. 7, 1928	New Haven Fish Co.
Halibut	114	July 14, 1928	Rich, A. F., & Co.
Halibut	460	June 2, 1928	Whitman, Ward & Lee Co.
Halibut	563	June 22, 1928	Whitman, Ward & Lee Co.
Flounders	3,000	May 11, 1928	Genesee Provision Co.
Flounders	360	May 11, 1928	Shore Fish Co.
Lobsters	140	June 27, 1928	Smith, J. C., & Son
Mackerel	1,255	Oct. 5, 1928	Banks Fish Market
Mackerel	725	Oct. 6, 1928	Boston Fish Market Corporation
Mackerel	370	July 2, 1928	Cefalu, Joseph
Mackerel	120	Aug. 11, 1928	Condi, J.
Mackerel	2,700	June 23, 1928	Fitch, Warren, Co.
Mackerel	740	June 21, 1928	Freeman & Cobb Co.
Mackerel	989	June 22, 1928	Freeman & Cobb Co.
Mackerel	2,350	June 23, 1928	Freeman & Cobb Co.
Mackerel	1,923	June 13, 1928	Peterson & Co.
Pollock	1,500	Oct. 5, 1928	Potomac Fish Co.
Pollock	1,500	Oct. 11, 1928	Potomac Fish Co.
Salmon	63	Sept. 8, 1928	Atlas Fish Co.
Salmon (fillets)	60	Sept. 28, 1928	Atlas Fish Co.
Scallops	72	Dec. 17, 1927	Arrington, H. R.
Scallops	1,080	Dec. 14, 1927	Eldridge, W. D.
Scallops	1,000	Oct. 1, 1927	Gifford, C. H.
Scallops	720	Oct. 17, 1928	Ginter Restaurant Co.
Scallops	240	Dec. 16, 1927	Pease, William
Scup	200	June 1, 1928	Cefalu, Joseph
Scup	160	Aug. 10, 1928	Cefalu, Joseph

¹ Original date of storage unknown.

TABLE 7. — *Articles which had been in Cold Storage Longer than Twelve Months and on which no Requests for Extensions had been made ordered removed from December 1, 1928, to December 1, 1929 — Concluded.*

ARTICLE.	Weight (Pounds).	Placed in Storage.	Name.
Scup	22	June 30, 1928	Goodspeed, L. B., Co.
Scup	139	May 31, 1928	Nagle, John, & Co.
Scup	320	June 13, 1927	Tocco, Joe
Shad roe	741	May 11, 1928	Burns, McKeon Co.
Shad roe	32	Apr. 27, 1928	Goodspeed, L. B., Co.
Sole	3,200	May 8, 1928	Atlantic & Pacific Fish Co.
Sole	2,450	May 10, 1928	Atlantic & Pacific Fish Co.
Sole	504	Nov. 7, 1928	Atlantic & Pacific Fish Co.
Sole	1,212	May 8, 1928	Booth Fisheries Co.
Sole	1,250	Oct. 6, 1928	Burns, McKeon Co.
Squid (bone)	367	Aug. 10, 1928	Chatham Weirs Co.
Squid	175	Sept. 25, 1928	Mantia, Salvatore
Squid (bone)	1,715	June 1, 1928	Tocco, Joe
Squid (bone)	3,300	June 4, 1928	Tocco, Joe
Whiting	230	Aug. 6, 1928	Mantia, Salvatore
Whiting	368	Sept. 25, 1928	Tocco, Joe

Summary of Tables 5, 6 and 7.

Requests for extension of time granted	339
Eggs	15
Poultry	48
Game	1
Meat	29
Fish	246
Requests for extension of time not granted	27
Eggs	1
Poultry	1
Meat	10
Fish	15
Articles ordered removed from storage (no requests made)	95
Butter	1
Eggs	4
Poultry	13
Game	3
Meat	17
Fish	57

TABLE 8. — *Confiscations.*

In stores:	
Beef (pounds)	148
Lamb (pounds)	7½
Pork (pounds)	286
Veal (pounds)	30
Poultry (pounds)	134
Fish (pounds)	51
Peas (pounds)	3½
Candy (pounds)	8
Eggs (dozen)	12
Onions (cans)	215
In cold storage warehouses:	
Beef (pounds)	900
Pork (pounds)	1,672
Poultry (pounds)	886
Venison (pounds)	60
Fish (pounds)	33,807
Eggs (dozen)	300
In slaughterhouses:	
Pork (pounds)	120

TABLE 9. — *Articles Other than Fish placed in Cold Storage from December 1, 1928, to December 1, 1929.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
December	732,830	247,860	294,745	139,756	1,449,545	585,477	1,058,681 ¹ / ₂	600,623 ¹ / ₂	638,028	3,615,009 ¹ / ₂	133,342	1,794,497
January	456,171	231,630	440,678	27,363	572,995	271,475	490,295	398,837	325,134	4,389,054 ¹ / ₂	100,406	2,273,650
February	306,226	83,460	480,215	42,009	221,694	83,601	530,798	229,429	229,596	3,404,993	16,502	1,937,187
March	467,977	327,120	504,685	71,738 ¹ / ₂	129,373	98,918	345,738	191,483	428,229	2,763,239	180,454	1,244,563
April	2,099,928	5,083,950	893,909	122,558	295,916	37,085	261,065	186,380	314,252	1,920,343	292,303	972,902 ¹ / ₂
May	2,754,500	1,506,103	1,506,103	62,851	351,914	48,587	188,457	256,971	334,318	2,225,888	57,807	1,611,061 ¹ / ₂
June	2,673,202	2,315,320	586,815	34,223	139,493	435,666	113,764	673,557	686,237 ¹ / ₂	3,494,684	185,237	1,328,331
July	7,314,201	1,427,190	768,164	124,025	96,656	241,537	63,159	406,613	941,883	2,771,263	169,638	1,855,698
August	3,600,794	1,125,090	708,407	310,049	154,364	220,273	116,991 ¹ / ₂	196,911	359,718 ¹ / ₂	2,027,649	98,373	1,568,101
September	1,821,472	772,440	668,248	383,301	530,710	170,504	87,003	254,633	1,208,943	1,779,943	152,460	1,363,405
October	1,385,374	643,830	642,053	364,168	923,936	263,896	54,053 ¹ / ₂	283,076	1,012,287	1,778,100	109,935	1,501,373
November	846,584	348,990	620,412	191,092	1,272,722	226,596	394,235	241,478	508,363	2,081,195	137,719	1,345,380

TABLE 10. — *Fish placed in Cold Storage from December 15, 1928, to December 15, 1929.*

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Pall and Silver Salmon (Pounds).	Salmon, all Others (Pounds).	Shad (Pounds).	Smelts, Eula- chon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish (Pounds).
January	2,900	-	1,450	562,580	368,532	287,045	124,534	87,576	2,409	-	116,974	230,062	-	1,137,093	158,300
February	-	-	4,386	411,563	207,027	142,000	111,787	100,074	550	-	220,883	315,972	2,346	780,366	124,992
March	-	-	9,292	631,479	35,518	245,285	146,704	45,886	12,803	-	303,408	72,971	670	79,595	112,030
April	-	-	-	894,555	94,635	136,489	81,809	62,547	30,038	-	23,910	90,019	2,560	3,966 ¹ / ₂	293,007
May	4,140	-	-	1,247,858	17,376	616,900	62,695	58,955	6,002	2,072	9,857	819,334	653	14,708	329,785
June	-	60,066	5,250	1,383,623	36,322	100,968	1,100,829	33,175	3,458	3,417	9,912	1,625,928	410	711,905	652,981
July	999	205,687	6,030	1,383,623	109,968	178,650	3,308,654	7,351	11,400	2,877	210	314,301	-	2,478,508	1,203,349
August	6,646	132,780	12,380	2,128,326	60,979	677,718	1,042,239	39,467	12,349	95,452	-	354,407	210	2,350,618	1,763,592
September	1,445	27,421	1,700	1,363,322	28,869	135,995	673,871	3,690	6,280	400	140	403,176	-	280,051	1,214,220
October	-	865	2,730	546,387	7,128	334,100	1,198,530	4,312	7,218	-	208	36,337	-	407,324	589,089
November	-	1,310	2,900	1,324,482	148,792	614,055	44,791	89,460	15,920	5,575	16,545	47,109	13,680	1,331,398	944,049
December	200	450	4,960	741,163	439,930	353,700	89,572	184,933	23,583	492	15,569	84,453	1,005	350,692	712,331

TABLE 11. — *Articles Other than Fish on Hand in Cold Storage on the First Day of the Month, from January 1, 1929, through December 1, 1929.*

	Butter (Pounds).	Eggs (Dozens).	Broken- out Eggs (Pounds).	Broilers (Pounds).	Roasters (Pounds).	Fowls (Pounds).	Turkeys (Pounds).	Miscel- laneous Poultry (Pounds).	Beef (Pounds).	Pork (Pounds).	Lamb and Mutton (Pounds).	Miscel- laneous Meats (Pounds).
January	5,992.195	975.795	986.214	745.341	2,973.750	984.986	993.186	1,557.023	1,873.801	5,964.134	579.303	3,383.865
February	3,583.516	223.740	799.684	637.771	3,126.896	679.116	1,331.076	1,530.198	1,700.683	8,742.636	238.892	4,135.251
March	1,859.190	6,420	662.934	540.483	2,878.432	513.608	1,635.995	1,314.527	1,602.583	11,212.100	177.390	4,874.119
April	760.422	218.640	463.458	403.151	2,357.370	312.150	1,548.813	981.502	1,562.873	11,564.126	274.748	4,802.709
May	328.843	5,185.020	769.429	347.623	1,890.180	145.947	1,460.321	757.985	1,211.404	10,789.570	463.868	4,128.433
June	1,785.486	8,482.620	1,763.428	212.420	1,501.982	85.379	1,313.276	739.893	1,084.902	9,439.703	444.921	3,874.920
July	7,738.785	10,315.710	1,807.886	68.096	1,068.032	442.642	1,173.570	1,191.141	1,340.246	11,328.272	501.259	3,640.144
August	13,771.023	10,868.120	1,921.074	127.713	566.490	488.337	924.243	1,338.492	1,180.988	10,825.263	411.548	3,760.015
September	15,283.605	10,435.650	1,911.177	364.720	356.070	519.907	866.126	1,296.104	782.377	9,098.844	374.162	3,762.671
October	14,836.171	9,230.130	1,930.942	694.258	706.139	553.494	556.973	1,390.140	1,440.369	7,128.959	472.555	3,323.623
November	13,069.257	6,722.430	1,801.386	982.890	1,480.045	673.051	343.307	1,507.774	1,995.260	3,373.479	531.316	2,730.220
December	9,694.577	4,091.325	1,653.112	1,107.313	2,631.153	788.795	514.999	1,378.605	2,322.960	3,256.679	603.669	2,690.903

TABLE 12. — *Fish on Hand in Cold Storage on the Fifteenth Day of the Month, from January 15, 1929, through December 15, 1929.*

	Bluefish (Pounds).	Butter- fish (Pounds).	Ciscoes (Pounds).	Cod, Hake, Pollock and Haddock (Pounds).	Halibut (Pounds).	Herring (Pounds).	Mackerel (Pounds).	Fall and Silver Salmon (Pounds).	Salmon, all Others (Pounds).	Shad (Pounds).	Smelts, Bala- chon, etc. (Pounds).	Squid (Pounds).	Whitefish (Pounds).	Whiting (Pounds).	Miscel- laneous Frozen Fish (Pounds).
January	12,612	94,030	1,621	1,466.145	406.782	991.080	4,873.541	195.319	58.049	15,060	95,845	2,266.836	6,903	3,730.750	1,171.583
February	11,116	18,369	2,225	341.205	242.103	708.858	3,643.776	184.607	41.148	14.147	221.319	1,821.925	3,317	2,556.641	753.872
March	9,054	18,898	8,615	246.772	142.611	390.427	2,272.330	112.310	27.943	4,419	402.202	1,237.035	980	1,384.172	518.870
April	7,695	9,118	1,186	649.888	290.437	135.266	1,299.405	75.567	44.293	3,347	292.631	958.738	2,525	636.726	468.837
May	11,093	992.059	2,554	992.059	230.328	435.239	667.138	54.340	40.174	4,419	252.898	1,529.212	529	297.139	632.781
June	10,962	67.281	4,379	1,808.849	261.577	450.172	1,634.031	41.761	38.660	5,426	245.060	3,019.660	677	968.489	917.351
July	12,137	271.482	2,137	2,268.161	346.211	228.410	4,608.352	21.695	24.829	7,678	242.604	3,089.720	677	3,309.194	1,814.713
August	15,907	392.071	7,762	3,684.465	305.914	565.116	5,627.138	59.491	28.021	102.959	234.835	2,964.484	520	4,089.363	3,194.496
September	15,905	416.980	3,202	3,754.656	416.701	434.597	6,186.169	45.872	32.431	102.574	232.690	2,964.484	400	4,659.411	4,000.630
October	10,732	386,509	5,649	2,582.915	402.488	414.691	6,899.612	45.637	35.386	71.473	221.192	2,211.122	13,680	4,397.083	3,675.140
November	7,344	371.580	5,349	2,476.176	471.561	642.249	6,031.006	119.080	33.004	70.243	203.086	1,839.815	13,680	4,470.337	3,684.949
December	6,896	339,140	9,434	1,845.109	710.723	720.313	4,658.124	251.376	48.137	72.486	1,373.263	1,373.263	12,127	3,792.608	3,342.301

TABLE 13. — *Summary of Slaughtering Inspections from December 1, 1928, through November 30, 1929.*

Total Number of Carcasses Inspected	197,697
Cattle	25,719
Calves	99,575
Hogs	62,564
Sheep	9,839
Total Number of Carcasses Condemned	2,503
Cattle	537
Calves	1,564
Hogs	385
Sheep	17

REASONS FOR CONDEMNATION.	Cattle.	Calves.	Hogs.	Sheep.	Totals.
Immaturity	—	1,449	—	—	1,449
Tuberculosis	431	37	57	—	525
Cholera	—	—	163	—	163
Pneumonia	8	2	69	1	80
Bruised	22	27	5	5	59
Died otherwise than by slaughter	19	18	7	2	46
Malnutrition	9	3	22	—	34
Septicæmia	9	1	20	—	30
Parturition	12	—	2	1	15
Icterus	1	7	3	1	12
Slaughtered illegally	6	1	2	2	11
Scours	—	9	—	—	9
Cirrhosis	—	1	7	—	8
Enteritis	2	4	2	—	8
Bitten by dogs	—	—	4	3	7
Tumor	—	—	6	—	6
General debility	2	—	2	—	4
Exhaustion	1	1	—	2	4
Navel ill	—	3	—	—	3
Abscesses	—	—	3	—	3
Peritonitis	2	—	1	—	3
Mange	—	—	3	—	3
Constipation	2	—	—	—	2
Edema	2	—	—	—	2
Erysipelas	—	—	2	—	2
Pyemia	2	—	—	—	2
Metritis	2	—	—	—	2
Unfit for food	1	—	1	—	2
Catarrh	—	—	1	—	1
Fever	—	—	1	—	1
Mastitis	1	—	—	—	1
Distemper	—	—	1	—	1
Overcome by heat	1	—	—	—	1
Insufficient bleeding	—	1	—	—	1
Urticaria	—	—	1	—	1
Poisoned	1	—	—	—	1
Cancer	1	—	—	—	1
Totals	537	1,564	385	17	2,503

REPORT OF DIVISION OF COMMUNICABLE DISEASES.

CLARENCE L. SCAMMAN, M.D., *Director.*

EDWARD A. LANE, M.D., *Assistant Director.*

GENERAL STATEMENT.

During 1929 there were reported 86,192 cases of communicable disease, a decrease of 16 per cent over the 1928 total. But 14,925 cases of measles were reported this year as against 41,519 for 1928. This accounts almost entirely for the decrease in communicable disease prevalence this year.

A brief summary of pertinent information is given herewith for certain diseases:

Anterior Poliomyelitis (Table I). — This disease was reported 119 times, giving a morbidity rate of 2.7 per 100,000 population. The cases were for the most part scattered throughout the State with no definite localization.

In cooperation with the Harvard Infantile Paralysis Commission, the Department continued to furnish special diagnostic service to physicians. Such service was furnished in 46 instances, in 22 of which a diagnosis of poliomyelitis was made.

Diphtheria (Tables XVII, XVIII, XIX, XX, XXI, XXII). — There were 4,255 cases of diphtheria and 256 deaths reported during 1929, giving a case rate of 97.1, a death rate of 5.8 and a fatality rate of 6.0.

In May of 1928 the curve of incidence had begun to drop below that of the previous year. It continued at a lower level until April of 1929, when it regained the level of the 1928 curve and paralleled it for five or six months. There was a sharp increase in reported cases for November, with 168 cases for the week ending November 16, which was the peak of the weekly incidence for 1929. This approximates the 1927 peak, with 169 cases for the week ending December 3, and is considerably in excess of the 1928 peak, with 123 cases for the week ending December 15. The peak usually occurs in December.

Following the sharp decline in 1924-1926, when the case rate decreased from 220 to 80, there has been a tendency for it to stabilize between 90 and 100.

One hundred nine communities reported diphtheria immunization programs in 1928 with a total of 67,067 completed treatments. The number of completed treatments reported for the State by years from 1920 to 1928 is as follows (the 1929 figures are not yet available):

1920	121	1926	33,843
1921	868	1927	52,881
1922	6,367	1928	67,067
1923	37,361		
1924	72,205	Total	303,591
1925	32,878		

The most outstanding piece of diphtheria immunization work which has been done to date was in the city of Lowell, where through the activities of the School Medical Director and the Board of Health, a most effective immunization program was carried out in 1929. Eleven thousand, three hundred and seventy-six children were given three doses of toxin-antitoxin; of these, 1,722 or 15.1 per cent were between the ages of six months and one year; 5,052 or 44.4 per cent were one to six years of age; and the balance, 4,602 or 40.5 per cent, were above the age of six years.

Several communities, more notably Salem, New Bedford, Newburyport and Springfield, have had a high incidence of the disease. But one of them, namely, Newburyport, has made any appreciable effort toward prevention by the use of toxin-antitoxin.

Two other smaller communities, Uxbridge and Northbridge, had a definite outbreak of the disease, which centered in a private school. There were 74 cases and 7 deaths. There is no regular medical service in the school and none was provided in this emergency. It is of some interest to note that an immunization program had been rejected by the school two years ago. The local boards of health of the two towns concerned were scarcely more alert to the situation than were the school authorities.

Epidemic Cerebrospinal Meningitis (Table II).—Particular interest is attracted to epidemic cerebrospinal meningitis this year on account of its epidemic prevalence on the West coast and a definite sharp outbreak in the city of Detroit. One hundred and sixty-seven cases were reported this year, which is the largest number reported in any year since 1920. Anticipating the possibility of an outbreak during the spring of 1930, the Department plans to set up a diagnostic service for this disease somewhat analogous to the service offered for anterior poliomyelitis by the Harvard Infantile Paralysis Commission.

Influenza.—This year 10,166 cases of influenza were reported as against 1,305 for 1928, a percentage increase of 679.

Massachusetts shared in the epidemic of influenza, which began late in 1928 and apparently reached its peak in this State in the period from about the middle of January to about the middle of February. This epidemic was about one-half as severe as that in 1920, and about one-eighth as severe as that in 1918. A detailed study of this outbreak was printed in the *New England Journal of Medicine* of September 5, 1929.

Malaria.—This disease was reported 27 times with 3 deaths. Of the 27 cases, 4 were of the "therapeutic" type. Of the 23 clinical cases remaining, 20 evidently contracted the disease outside the State; on 2 the evidence was insufficient to determine the source of infection, and in the remaining case the infection appeared to have been contracted in the State. Elsewhere in the report a short statement appears on "Malaria Prevention" by our Consulting Epidemiologist, Dr. W. G. Smillie.

Rabies.—Dog bites, whether or not requiring anti-rabic treatment, were made reportable in September, 1928. During the present calendar year 4,635 dog bites were reported. Two persons died of rabies during the year.

Scarlet Fever (Table V).—This year 9,975 cases of scarlet fever were reported, giving a case rate of 227.7, a mortality rate of 1.6 and a fatality rate of .7. Both the mortality and fatality rates were the lowest since the disease was declared reportable in 1884.

Septic Sore Throat.—This year 271 cases were reported with 52 deaths.

A milk-borne outbreak occurred in June with 84 cases and 2 deaths. Only 13 of these cases were officially reported. A detailed story of this outbreak may be found in the *American Journal of Public Health*, Vol. XIX, No. 12, December, 1929.

Smallpox (Table VI).—Of the 273 cases reported, but 9 had ever been vaccinated, and these from fifteen to forty years prior to attack. Two hundred and forty-five of the cases are accounted for by an outbreak in Middleborough and the neighboring communities. There were no fatalities in this outbreak. Of the remaining 28 cases, 15 were connected with the Gardner outbreak of 1928 and the balance were concerned with two outbreaks in Boston and sporadic cases scattered over the State.

Typhoid Fever (Table IX).—Three hundred and seven cases of typhoid fever were reported for the year with 42 deaths. On this basis the case rate is 7.0, mortality rate, 1.0, and fatality rate, 13.7.

Of the 307 reported cases, the source of infection was discovered in 71 instances. Of the 71 cases in which the source of infection was known, 7 per cent were traced to polluted water, 4.2 per cent to food infected by carrier, 16.9 per cent to food infected by an unknown source, 12.7 per cent to contact with carriers, and 59.2 per cent to contact with known cases. This deplorably high incidence of secondary cases indicates the importance of proper contact precautions in the care of every case of typhoid fever, immunization of the family, and early hospitalization or trained nursing care of the case if at home. There was no case traced to milk.

Our records show that of the 307 cases reported, 178 were hospitalized.

Of the total reported cases, 62.2 per cent had release cultures; 13.7 per cent died; and for the remaining 24.1 per cent there is no information with regard to release cultures. In 1928, of the 310 cases reported, 57.8 per cent had release cultures; 11.4 per cent died; and there was no information with regard to release cultures on 30.8 per cent.

Six new typhoid carriers were added to our list this year, one of whom moved into the State as a known carrier from New York. One carrier had her gall bladder removed at State expense. To date all her cultures have been negative over a period of nine months. During the period 1924-1929 nine cholecystectomies were done, 1 in 1924, 6 in 1927, 1 each in 1928 and 1929. Of these nine individuals, the carrier condition has been cured in four; three have not submitted the required number of negative cultures for the removal from the list; and two are now furnishing monthly specimens.

Undulant Fever. — This disease is being made reportable as of January 1, 1930. During the year there has been unusual interest in the disease. Eight cases have come to the attention of the Department, in which the infection originated in Massachusetts.

OUTBREAKS.

January, February, March. — Typhoid fever; Norton. Confined to one family. Source of infection, mother (proven a carrier). Seven cases and two deaths.

February. — Food poisoning; Chelsea; probably fish. Seven cases and no deaths.

February. — Typhoid fever; Canton-Norwood. Apparently due to infection of water supply in an industrial plant where cases were employed. Five cases and one death.

March. — Scarlet fever; Framingham. Traced to raw milk probably infected by a mild unrecognized case in a dairy worker. Fifteen cases and no deaths.

March. — Acute gastro-intestinal upset; Revere; in one family. Cheese suspected. Four cases and no deaths.

March. — Scarlet fever; Plymouth. Probable source of infection was milk handler having a history of "grippe" some six weeks before. One hundred and twenty-seven cases and no deaths.

April, May. — Smallpox; Middleborough. Source of infection unknown. Two hundred twenty-three cases and no deaths; twenty-two contact cases in outside communities.

May, June. — Whooping cough; North Reading State Sanatorium; twenty-nine cases and no deaths.

June. — Septic sore throat, Charlton. Source of infection dairyman or his family, all of whom had scarlet fever except the mother, who had a septic finger. Eighty-four cases and two deaths (thirteen cases only officially reported).

July. — Food poisoning; Wilmington; ice cream suspected. Family party. Seventeen cases and no deaths.

July, August. — Typhoid fever; Lynn; fifteen cases in Lynn and surrounding towns; 12 or possibly 13 of whom gave a history of having eaten boiled lobster purchased from same source. Thirteen cases and two deaths.

August. — Food poisoning; Sterling Junction camp. Source of infection was fermented bread. Thirty-five cases and no deaths.

August. — Food poisoning at camp; West Brookfield. Of 40 boys at camp, 14 were ill. Source unknown. Fourteen cases and no deaths.

August. — Gastro-intestinal upset among employees; North Reading State Sanatorium. Specimens negative for typhoid, para-typhoid and dysentery group. Water negative for colon. Sixty-six cases and no deaths.

September. — Gastro-enteritis; Norton. Three children in same family ill. One child died. Source of infection unknown. Three cases and one death.

September, October. — Bacillary dysentery; Lowell. All in one family. Nine cases and one death.

October. — Bacillary dysentery; Lowell. All in one family. Six cases and two deaths.

October. — Food poisoning; Reading. "Inn" dining room. Catsup suspected. Eight cases and no deaths.

October. — Typhoid fever; Palmer. Contact infection among Polish families. Eight cases and no deaths.

October, November, December. — Diphtheria; Northbridge and Uxbridge. Cases largely connected with private school. Seventy-four cases and seven deaths.

November. — Dysentery; Wellesley (Children's Hospital Convalescent Home). Due to one child admitted in incubation period. Three cases and no deaths.

November, December. — Typhoid fever; Lowell. Same family. Source of infection of first case (fatal) unknown. Others contact infection. Eleven cases and one death.

MINIMUM QUARANTINE REQUIREMENTS.

The minimum quarantine requirements approved by the Massachusetts Association of Boards of Health and this Department have been legally adopted by eighty cities and towns. Many other towns are using these requirements but have not legally adopted them on account of the cost of publication as the law requires.

LOCAL REGULATIONS.

Local boards of health were requested to send to the Department a copy of their printed regulations, or a statement that none existed. Of the seventy-five cities and towns in the State with a population of more than 10,000, all except two, or 97 per cent, had regulations. Of the remaining two hundred and eighty communities under 10,000, one hundred thirty-three, or 44 per cent, had no regulations.

During the year a committee was appointed by the Massachusetts Association of Boards of Health to cooperate with this Department in drawing up rules and regulations for local boards of health in communities under 20,000.

IMMUNIZATION OF HOSPITAL NURSES.

On account of outbreaks of typhoid fever and diphtheria in two different general hospitals in the State in 1928, a letter was sent early in the year to one hundred fifty-three general hospitals urging that their nursing staff be immunized against diphtheria, typhoid fever and smallpox. Replies were received from but fifteen, or ten per cent. Fifteen required immunization against smallpox, fourteen against typhoid fever, and twelve against diphtheria.

UNION HEALTH DISTRICTS.

Of the seventy-five communities with a population of over 10,000, only four have full time medical health officers; several others have part time medical health officers. A few more have full time laymen, who on account of their past experience or training in public health administration are able to apply modern methods of public health procedure in their communities with success. The most fundamental need in the State at the present time is a union of several communities into a district which will approximate a population of at least 20,000, under a well trained, full time medical health officer. Except for the fifteen towns making up the Barnstable County Health Unit, we have no such combination in the balance of the 265 communities with a population under 10,000. Local health authorities in communities of this size have little, if any, conception of the administrative problems connected with the control of communicable diseases, such as diphtheria, typhoid fever and smallpox, all of which are preventable if the knowledge we have in regard to their control is properly applied. Few of these communities offer to their citizens any well considered program of health promotion or disease prevention. Many other problems, which are relatively simple for the person trained in modern public health administration are but imperfectly understood by the untrained individual.

SUMMER CAMPS.

In May of this year, a suggested set of Health Standards for Summer Camps, with special reference to Sanitation, Medical Supervision and Nutrition, approved by the Massachusetts Association of Boards of Health and the New England Camp Directors Association, was issued by this Department. These standards were distributed to all camp directors in the State in June. The Department appreciates the thoughtful cooperation of the local health authorities and the Camp

Directors in drawing up these standards. Local boards of health may regulate the establishment and operation of summer camps under Section 31 of Chapter 111 of the General Laws, but there is no such authority given to the State.

DISTRICT HEALTH OFFICERS.

The activities of the six District Health Officers during the past year, in addition to those required by statute, such as inspection of jails, lock-ups, hospitals, etc., have been as follows: routine visits to local boards of health, investigations of outbreaks of communicable disease, assistance in the furthering of the Chadwick tuberculosis clinics and diphtheria immunization programs, and in the establishment of cancer clinics in their respective districts. In addition, the usual semi-annual check-up of typhoid carriers has been done.

This year eight surveys were made by the District Health Officers as against four last year. This is a worth while method of stimulating local interest in public health problems if applied with discrimination.

The District Health Officers were called in consultation 192 times by physicians in their districts.

Approximately 10,000 people were reached through lectures by the personnel of the Division.

VENEREAL DISEASE.

The year has seen a considerable further development over 1928 in the program for the control of gonorrhea and syphilis. Foremost among the advances was the adoption by the Department of regulations not only requiring the reporting of all forms of gonorrhea and syphilis, but also that reports should be made to the State Department of Public Health and not to the local authorities as heretofore; further extension of the program of medical information for Massachusetts physicians; a marked increase in the variety of audiences that have been reached in the State; and a definite awakening of interest on the part of both professional and lay groups in the problem of the control of gonorrhea and syphilis.

There were reported 4,410 cases of communicable gonorrhea and 1,531 cases of communicable syphilis during the year. The case rates per 100,000 population, 100.7 for gonorrhea and 35.0 for syphilis, indicate again an apparent decline over the previous year. (Table XI.)

The same comment which was made in the report for 1928 may be applied to this apparent decrease, that coincident with the change of reporting in 1925, when gonorrhea and syphilis were made reportable to local boards of health, many communities reported less cases or ceased reporting altogether. The apparent decline, therefore, may be no indication of a decrease in actual incidence.

There were 133 deaths from syphilis, with a death rate per 100,000 of 3.0, and a fatality rate of 8.7. Since paresis and tabes dorsalis are due, in 100 per cent of the cases, to syphilis, deaths from these diseases should be included among deaths due to syphilis. There were 186 deaths from paresis and 51 deaths from tabes dorsalis, giving a combined death rate from syphilis of 8.4 per 100,000. (Table XII.)

There are still 52 treatment centers in the State. No new clinics have been added nor any of the old ones closed. Fourteen of these clinics were subsidized by this Department during the entire year and that at Fitchburg for four months of the year. (Table XIII.)

The social worker has continued to investigate special cases and to visit the clinics and local boards of health. Local authorities all over the State are assuming more and more of the responsibility for the follow-up of lapsed cases. The police-women throughout the State have made excellent use of the clinics for the examination of sex offenders. During the year 353 cases were referred to our social worker for investigation. Of these 335 were closed; 247 satisfactorily, and 88 as lost. Of 51 sources of infection investigated, 25 were located and placed under treatment. Of 69 lapsed cases referred to our Social Service, 20 were satisfactorily closed, 7 refused further treatment, and 42 could not be located.

An interesting experiment in social service is being conducted under the joint auspices of this Department, the Massachusetts Society for Social Hygiene and

the Lowell Board of Health at the Lowell Venereal Disease Clinic. A comparison of the first six months of social service with the previous six months without social service reveals the following interesting facts:

1. New admissions to clinic for syphilis increased 100 per cent.
2. New admissions to clinic for gonorrhea increased 25 per cent.
3. Admissions of relatives and contacts for examination increased 180 per cent.
4. Total visits to the clinic for syphilis and gonorrhea increased 25 per cent.
5. Sources of infection of gonorrhea and syphilis increased from 9 to 59 (40 of the 59 were examined).
6. Of 262 cases which had lapsed treatment, 152 were successfully returned to treatment.

Physicians all over the State are showing an increased interest in the control of gonorrhea and syphilis. Eleven medical societies and three medical schools have asked for talks on this subject during the year. Three publications dealing with the treatment and control of gonorrhea and syphilis have been sent to all the physicians in the State, and two others are under preparation. Pamphlets of information for patients with syphilis are available for distribution by physicians to their patients, and one for men with gonorrhea is under preparation. It is planned to have several clinics on the treatment of gonorrhea and syphilis at the New England Health Institute which is to be held in Boston in April, 1930. One of the most encouraging evidences of the interest of physicians in the program of this Department for the control of these diseases is the willingness of large groups of them to give advice and suggestions concerning proposed literature or procedures.

The offer of arsenicals to all licensed physicians in Massachusetts in November, 1928, has led to a considerable increase in the distribution of these products. The total arsenicals distributed increased from 31,240 grams in 1927 to 38,066 grams in 1928, and 44,533 grams in 1929. Physicians received 7,600 grams during 1929. The number of physicians using arsenicals distributed by the State has increased from 53 in October, 1928, to 333 in December, 1929. (Tables XIV, XV.)

During the year 147 lectures were given by the members of the staff of the Division and the Executive Secretary of the Massachusetts Society for Social Hygiene to a total audience of 10,000 persons, and 16,000 pieces of literature were distributed. In addition to the listed publications of this Sub-Division, there have been prepared, or purchased, for distribution the following:

1. "Information for the Patient with Syphilis."
2. "The Management of Syphilis in General Practice."
3. "Congenital Syphilis."
4. "The Treatment of Gonococcal Urethritis in the Male."

BACTERIOLOGICAL LABORATORY.

During the year ending December 31, 1929, the Bacteriological Laboratory examined 34,015 specimens. There has been a slight decrease in the number of cultures to be examined for diphtheria bacilli. The work has increased, however, on account of the larger number of specimens requiring special examinations such as identification of organisms. This often requires detailed and time-consuming work. (Table XVI.)

Interest in undulant fever is increasing and about twice as many tests were made this year as last.

Probably on account of recent outbreaks of septic sore throat and scarlet fever, apparently milk-borne, many samples of milk are sent to the laboratory to be examined for hemolytic streptococci.

The total number of examinations were 34,015 as follows: diphtheria, 15,841; tuberculosis, 4,194; typhoid fever, 3,968 (Widal test, 1,762; blood, feces and urine for typhoid bacilli, 2,206), gonorrhea, 7,110; malaria, 42; miscellaneous, 2,860.

TABLE I. — *Anterior Poliomyelitis.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	167	4.0	52	1.3	31.1
1926	245	5.8	44	1.0	18.0
1927	1,189	27.8	169	4.0	14.2
1928	434	10.0	65	1.5	15.0
1929	119	2.7	21	.5	17.6

TABLE II. — *Epidemic Cerebro-Spinal Meningitis.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	112	2.7	35	.8	31.3
1926	116	2.8	39	.9	33.6
1927	75	1.8	43	1.0	57.3
1928	107	2.5	38	.9	35.5
1929	167	3.8	79	1.8	47.3

TABLE III. — *Lobar Pneumonia.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	5,544	133.3	2,364	56.9	42.6
1926	5,134	121.8	2,409	57.2	46.9
1927	4,279	100.2	1,969	46.1	46.0
1928	4,785	110.6	2,163	50.0	45.2
1929	5,287	120.7	2,202	50.3	41.6

TABLE IV. — *Measles.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	28,816	693.0	337	8.1	1.2
1926	30,020	712.4	367	8.7	1.2
1927	13,498	316.2	87	2.0	.6
1928	41,519	960.0	265	6.1	.6
1929	14,925	340.7	121	2.8	.8

TABLE V. — *Scarlet Fever.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	10,319	248.2	117	2.8	1.1
1926	11,323	268.7	117	2.8	1.0
1927	16,546	387.6	144	3.4	.9
1928	10,473	242.2	90	2.1	.9
1929	9,975	227.7	71	1.6	.7

TABLE VI. — *Smallpox.*

YEAR.	Cases.	Deaths.
1925	3	—
1926	4	—
1927	2	—
1928	19	—
1929	273	1

TABLE VII. — *Tuberculosis, Pulmonary.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	5,385	129.5	2,883	69.3	53.5
1926	5,444	129.2	2,961	70.3	54.4
1927	5,049	118.3	2,774	65.0	54.9
1928	4,873	112.7	2,690	62.2	55.2
1929	4,538	103.6	2,561	58.5	56.4

TABLE VIII. — *Tuberculosis, Non-Pulmonary.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	825	19.8	576	13.9	69.8
1926	874	20.7	555	13.2	63.5
1927	807	18.9	429	10.0	53.2
1928	757	17.5	433	10.0	57.2
1929	649	14.8	361	8.2	55.6

TABLE IX. — *Typhoid Fever.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	592	14.2	73	1.8	12.3
1926	547	13.0	61	1.4	11.1
1927	466	10.9	44	1.0	9.4
1928	310	7.2	36	.8	11.6
1929	307	7.0	42	1.0	13.7

TABLE X. — *Whooping Cough.*

YEAR.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	8,077	194.2	269	6.5	3.3
1926	11,547	274.0	391	9.3	3.4
1927	6,273	146.9	149	3.5	2.4
1928	8,023	185.5	208	4.8	2.6
1929	7,708	176.0	137	3.1	1.8

TABLE XI. — *Gonorrhea and Syphilis.*

YEAR.	GONORRHEA.		SYPHILIS.				
	Cases.	Case Rate per 100,000.	Cases.	Case Rate per 100,000.	Deaths.	Death Rate per 100,000.	Fatality Rate (Per Cent).
1925	5,192	124.9	2,147	51.6	148	3.6	6.9
1926	4,920	116.8	1,904	45.1	165	3.9	8.7
1927	4,294	100.6	1,666	39.0	135	3.2	8.1
1928	4,506	104.2	1,569	36.3	164	3.8	10.5
1929	4,410	100.7	1,531	35.0	133	3.0	8.7

TABLE XII. — *General Paralysis of the Insane.*

YEAR.	DEATHS.		FIRST ADMISSIONS TO STATE INSTITUTIONS FOR MENTAL DISEASES.		
	Deaths.	Death Rate per 100,000.	First Admissions.	Rate per 100,000.	Per Cent of All First Admissions.
1925	229	5.5	249	6.0	8.4
1926	230	5.5	232	5.5	8.0
1927	198	4.6	190	4.5	6.7
1928	204	4.7	202	4.7	6.4
1929	186	4.2	226	5.2	7.4

TABLE XIII. — *Gonorrhea and Syphilis Treated in Clinics and Institutions.*
Subsidized Clinics.

YEAR.	NEW CASES.		Visits.	Number of Clinics.
	Gonorrhea.	Syphilis.		
1925	1,954	3,519	154,731	15
1926	2,060	3,178	136,179	15
1927	2,351	3,307	160,444	15
1928	2,286	2,274	174,714	15
1929	2,238	2,163	172,777	15

Non-Subsidized Clinics.

1928	177	378	18,147	9
1929	214	446	21,485	10

Institutions.

1928	338	635	—	27
1929	344	660	—	27

TABLE XIV. — *Grams of Arsphenamine, Sulpharsphenamine and Neoarsphenamine Distributed.*

YEAR.	Arsphenamine.	Sulpharsphenamine.	Neoarsphenamine.	Total.	Accumulative Total.
1925	15,573	16,647	—	32,220	162,441 ¹
1926	13,036	19,737	—	32,773	195,214
1927	14,010	17,230	—	31,240	226,454
1928	8,312	16,619	13,134	38,066	264,520
1929	8,753	17,634	18,146	44,533	309,053

TABLE XV. — *Grams of Arsphenamine, Sulpharsphenamine and Neoarsphenamine Distributed to Subsidized Clinics, Other Institutions and Physicians.*

Clinics.

YEAR.	Arsphenamine.	Sulpharsphenamine.	Neoarsphenamine.	Total.
1927	13,075	9,812	—	22,887
1928	6,972	8,537	8,648	24,157
1929	7,328	7,481	9,615	24,624

Institutions.

1927	922	6,903	—	7,825
1928	1,187	6,966	3,137	11,290
1929	1,101	7,317	3,851	12,269

Physicians.

1927	13.2	515	—	528
1928	153.4	1,116	1,350	2,619
1929	123.4	2,836	4,681	7,640

¹ 1918-1925, inclusive.

TABLE XVI. — *Laboratory Examinations.*

	Positive.	Negative.	Total.
Diphtheria:			
Diagnosis	943	10,230	11,173
Release	1,327	3,341	4,668
Tuberculosis:			
Sputum	827	3,233	4,060
Animal inoculations	29	105	134
Typhoid fever:			
Widal test	170	1,549	1,762 ¹
Examination for typhoid bacilli:			
Blood	—	42	42
Feces	61	1,368	1,429
Urine	2	733	735
Gonorrhea	1,460	5,650	7,110
Malaria	3	39	42
Miscellaneous:			
Pneumococcus type determination	—	—	585
Hemolytic streptococci	—	—	1,504
Spinal fluid for meningococci	—	—	31
Undulant fever	6	161	167
Unclassified	—	—	573
Total			34,015

TABLE XVII. — *Diphtheria Cases, Case Rates, Deaths, Death Rates and Fatality Rate.*

YEAR.	Cases. ²	Case Rate per 100,000.	Deaths. ³	Death Rate per 100,000.	Fatality Rate (Per Cent.).
1842	—	—	129	16.30	—
1843	—	—	115	14.08	—
1844	—	—	122	14.48	—
1845	—	—	261	30.06	—
1846	—	—	218	24.38	—
1847	—	—	277	30.12	—
1848	—	—	265	28.03	—
1849	—	—	338	34.80	—
1850	—	—	291	29.19	—
1851	—	—	411	40.11	—
1852	—	—	429	40.77	—
1853	—	—	608	56.29	—
1854	—	—	562	50.73	—
1855	—	—	537	47.29	—
1856	—	—	519	44.94	—
1857	—	—	518	44.12	—
1858	—	—	515	43.16	—
1859	—	—	560	46.19	—
1860	—	—	837	67.96	—
1861	—	—	1,104	89.03	—
1862	—	—	1,147	91.88	—
1863	—	—	2,284	181.75	—
1864	—	—	1,999	158.03	—
1865	—	—	1,176	92.36	—
1866	—	—	830	63.32	—
1867	—	—	607	45.02	—

¹ Includes 43 atypical.² Diphtheria cases reportable since June, 1893.³ Diphtheria first recorded as cause of death in 1858 (diphtheritis). Before that date figures are for croup; after that year deaths from diphtheria and from croup are combined.

TABLE XVII. — *Diphtheria Cases, Case Rates, Deaths, Death Rates and Fatality Rates* — Continued.

YEAR	Cases. ¹	Case Rate per 100,000.	Deaths. ²	Death Rate per 100,000.	Fatality Rate (Per Cent).
1868	—	—	782	56.43	—
1869	—	—	769	54.03	—
1870	—	—	676	46.28	—
1871	—	—	747	49.81	—
1872	—	—	753	48.93	—
1873	—	—	745	47.21	—
1874	—	—	913	56.46	—
1875	—	—	1,880	113.51	—
1876	—	—	3,294	195.82	—
1877	—	—	3,178	186.06	—
1878	—	—	2,517	145.16	—
1879	—	—	2,293	130.29	—
1880	—	—	2,394	134.06	—
1881	—	—	2,383	131.01	—
1882	—	—	1,771	95.61	—
1883	—	—	1,621	85.97	—
1884	—	—	1,646	85.79	—
1885	—	—	1,523	78.03	—
1886	—	—	1,558	77.51	—
1887	—	—	1,628	78.71	—
1888	—	—	1,831	86.09	—
1889	—	—	2,214	101.32	—
1890	—	—	1,626	72.48	—
1891	—	—	1,218	53.03	—
1892	—	—	1,455	61.91	—
1893	—	—	1,394	58.00	—
1894	4,178	170.06	1,801	73.31	43.11
1895	7,806	310.97	1,784	71.07	22.85
1896	8,515	331.34	1,677	65.25	19.69
1897	7,613	289.51	1,426	54.23	18.73
1898	3,980	147.99	706	26.25	17.74
1899	7,134	259.51	1,047	38.09	14.68
1900	12,641	450.06	1,475	52.51	11.67
1901	9,293	343.60	1,166	40.91	11.91
1902	7,036	243.33	873	30.19	12.41
1903	6,888	234.84	869	29.63	12.62
1904	6,772	227.67	699	23.50	10.32
1905	5,059	184.95	652	21.62	11.69
1906	7,967	275.45	743	24.05	8.73
1907	9,098	283.47	752	23.79	8.39
1908	8,939	281.59	747	23.09	8.20
1909	8,795	232.88	694	20.98	9.01
1910	7,390	218.63	679	20.09	9.19
1911	6,998	203.17	563	16.35	8.05
1912	5,433	154.84	473	13.48	8.71
1913	6,741	188.66	628	17.57	9.32
1914	8,080	222.14	652	17.93	8.07
1915	9,282	250.75	720	19.45	7.76
1916	7,282	194.84	629	16.83	8.64
1917	10,322	273.57	838	22.21	8.12
1918	6,922	181.74	608	15.96	8.78
1919	7,929	206.24	593	15.42	7.48

¹ Diphtheria cases reportable since June, 1893.² Diphtheria first recorded as cause of death in 1858 (diphtheritis). Before that date figures are for group; after that year deaths from diphtheria and from group are combined.

TABLE XVII. — *Diphtheria Cases, Case Rates, Deaths, Death Rates and Fatality Rates — Concluded.*

YEAR.	Cases. ¹	Case Rate per 100,000.	Deaths. ²	Death Rate per 100,000.	Fatality Rate (Per Cent).
1920	7,513	193.73	591	15.23	7.87
1921	9,100	231.21	607	15.42	6.67
1922	8,826	221.13	606	15.18	6.87
1923	9,018	222.83	579	14.31	6.42
1924	7,290	177.69	534	13.02	7.33
1925	4,482	107.79	333	8.01	7.43
1926	3,401	80.71	249	5.91	7.32
1927	4,750	111.30	268	6.30	5.60
1928	4,052	93.70	249	5.80	6.10
1929	4,255	97.10	256	5.80	6.00

¹ Diphtheria cases reportable since June, 1893.² Diphtheria first recorded as cause of death in 1858 (diphtheritis). Before that date figures are for croup; after that year deaths from diphtheria and from croup are combined.

TABLE XVIII. — *Diphtheria Cases by Age and Sex, 1918-1929.*

YEAR.	UNDER 1.				1.		2.		3.		4.		5-9.		10-14.		15-19.		20+.		UNKNOWN.		?. Total.
	M.		F.		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	Total.		
	M.		F.																				
	M.		F.																				
1918	100	95	166	115	258	192	278	262	281	249	1,020	1,067	421	429	182	165	384	578	359	258	63	6,922	
1919	90	55	161	106	253	205	291	287	307	292	1,420	1,437	533	612	143	143	263	583	342	333	41	7,929	
1920	82	52	160	115	243	205	283	280	304	297	1,347	1,254	438	516	151	210	246	546	327	407	55	7,513	
1921	100	75	163	128	262	250	334	389	303	303	1,717	1,739	549	631	136	216	258	634	341	384	31	9,100	
1922	97	109	185	172	349	299	344	333	389	366	1,603	1,668	538	585	149	202	269	549	267	310	43	8,826	
1923	76	61	208	152	278	314	372	343	429	341	1,833	1,874	511	532	134	178	266	580	248	220	35	9,018	
1924	101	56	177	117	279	206	349	312	343	341	1,197	1,177	424	470	120	156	264	500	307	321	73	7,290	
1925	65	40	103	79	153	137	174	189	204	216	839	705	246	255	79	109	192	290	174	173	63	4,482	
1926	40	14	83	60	128	124	154	151	156	143	588	569	158	146	60	72	158	290	128	121	82	3,401	
1927	33	30	93	90	177	141	181	178	233	213	929	869	278	265	65	105	228	319	128	137	58	4,750	
1928	25	29	69	60	147	122	177	138	184	182	746	708	228	250	49	88	138	283	137	158	74	4,052	
1929	36	23	67	54	140	118	163	146	176	176	806	744	284	273	63	97	181	329	130	174	41	4,255	

TABLE XIX. — *Diphtheria Deaths by Age and Sex, 1918-1929.*

YEAR.	UNDER 1.		1.		2.		3.		4.		5-9.		10-14.		15-19.		20+.		Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.			
1918	30	20	50	27	40	37	41	43	27	26	94	84	23	20	6	4	24	12	608
1919	16	11	38	32	57	40	35	43	32	37	98	92	13	19	2	7	11	10	593
1920	25	16	35	39	47	34	44	31	31	32	101	95	15	19	7	7	6	10	591
1921	22	12	41	46	58	30	44	46	35	36	113	103	17	23	1	2	8	13	607
1922	27	28	47	43	50	32	31	37	37	42	86	90	15	11	6	6	5	15	605
1923	22	16	38	29	29	47	48	41	30	34	86	107	11	10	2	3	8	14	579
1924	26	22	40	31	42	41	40	22	41	31	74	67	10	21	2	3	7	8	534
1925	18	5	33	25	21	22	16	17	24	18	50	51	6	7	3	1	10	5	383
1926	6	6	20	14	14	14	20	14	17	15	42	35	6	6	3	3	6	7	249
1927	7	5	8	18	19	21	8	18	17	15	53	43	9	9	3	1	10	9	268
1928	2	3	16	13	21	20	13	17	15	13	52	41	5	6	2	2	4	5	249
1929	7	-	16	13	18	18	14	18	16	21	43	36	3	9	1	2	9	12	256

TABLE XX. — *Diphtheria Cases by Months, 1901-1929.*

YEAR.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1901 . . .	1,484	1,012	983	741	672	728	452	492	495	853	1,096	785	9,793
1902 . . .	787	664	615	544	585	486	361	373	490	716	751	664	7,036
1903 . . .	642	551	464	387	500	453	392	407	433	955	866	838	6,888
1904 . . .	794	548	533	524	458	555	398	352	523	716	684	687	6,772
1905 . . .	575	426	392	425	499	402	326	260	389	634	731	722	5,781
1906 . . .	669	574	595	493	497	501	368	452	720	1,175	1,201	1,060	8,305
1907 . . .	1,023	703	760	774	680	684	521	580	616	838	859	924	8,962
1908 . . .	709	628	737	544	689	589	452	518	709	1,209	1,231	1,093	9,108
1909 . . .	922	589	659	523	514	510	420	387	518	857	928	875	7,702
1910 . . .	816	685	594	636	611	555	434	427	544	685	645	758	7,390
1911 . . .	1,194	589	548	524	468	593	312	353	471	677	593	676	6,998
1912 . . .	541	523	416	347	394	349	299	303	370	550	722	619	5,433
1913 . . .	605	562	592	566	588	488	406	323	445	642	707	817	6,741
1914 . . .	758	623	594	509	577	494	421	387	512	1,095	1,162	948	8,080
1915 . . .	832	681	737	648	710	609	513	564	697	1,091	1,181	1,019	9,282
1916 . . .	840	711	692	610	543	555	418	480	463	595	593	782	7,282
1917 . . .	869	783	858	738	876	793	597	590	729	1,152	1,181	1,156	10,322
1918 . . .	950	678	744	667	663	473	453	337	430	410	532	585	6,922
1919 . . .	739	681	659	532	561	483	427	324	530	992	983	1,018	7,929
1920 . . .	938	640	559	471	478	586	472	428	415	744	839	943	7,513
1921 . . .	965	795	755	676	644	623	441	516	525	887	1,185	1,088	9,100
1922 . . .	905	785	713	576	558	459	380	482	578	1,021	1,263	1,106	8,826
1923 . . .	890	655	698	609	594	613	482	559	605	1,060	1,151	1,102	9,018
1924 . . .	1,079	829	629	672	559	532	412	380	318	583	620	677	7,290
1925 . . .	578	497	429	394	351	357	259	200	288	388	351	390	4,482
1926 . . .	391	273	304	228	205	276	174	127	209	291	418	505	3,401
1927 . . .	461	424	429	377	336	388	264	216	291	432	542	590	4,750
1928 . . .	485	496	411	337	315	261	163	172	157	413	359	483	4,052
1929 . . .	490	331	344	360	315	270	239	179	222	432	556	517	4,255

TABLE XXI. — *Diphtheria Deaths by Months, 1901-1929.*

YEAR.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1901 . . .	181	117	119	93	76	74	63	52	61	104	117	109	1,166
1902 . . .	115	86	64	74	70	59	37	41	47	89	87	104	873
1903 . . .	81	85	71	55	69	46	57	56	63	101	108	77	869
1904 . . .	89	71	60	46	42	43	38	38	49	68	76	79	699
1905 . . .	92	48	52	53	52	50	28	25	47	60	85	60	652
1906 . . .	67	80	67	57	50	41	26	46	53	69	95	92	743
1907 . . .	73	54	72	69	70	55	42	59	54	72	62	70	752
1908 . . .	79	64	73	57	57	45	39	42	46	70	84	91	747
1909 . . .	85	56	70	37	46	42	33	33	46	66	74	106	694
1910 . . .	77	55	56	56	49	51	42	33	54	73	59	74	679
1911 . . .	68	65	61	52	42	38	31	25	33	46	46	56	563
1912 . . .	58	41	36	28	28	31	29	17	40	49	45	71	473
1913 . . .	59	59	67	50	54	56	41	33	37	36	66	60	628 ¹
1914 . . .	66	70	53	53	40	39	23	34	44	75	69	86	652
1915 . . .	63	63	78	60	53	36	43	43	45	58	86	92	720
1916 . . .	79	64	63	53	47	35	38	27	37	50	67	69	629
1917 . . .	78	77	54	66	87	68	44	50	61	80	82	91	838
1918 . . .	90	57	57	68	41	29	34	26	37	61	34	74	608
1919 . . .	59	68	62	42	37	23	27	20	32	56	76	91	593
1920 . . .	103	69	56	32	32	42	36	28	28	55	45	65	591
1921 . . .	71	64	52	42	47	39	31	35	36	62	64	64	607
1922 . . .	85	44	46	38	38	25	20	33	40	66	84	87	606
1923 . . .	80	56	58	35	35	33	32	34	37	63	61	55	579
1924 . . .	72	63	52	66	50	29	34	33	20	27	46	42	534
1925 . . .	53	30	31	25	24	24	20	13	23	29	29	32	333
1926 . . .	24	22	23	25	14	20	9	7	19	18	29	39	249
1927 . . .	27	24	27	26	13	21	18	16	14	23	29	30	268
1928 . . .	28	40	15	24	29	12	9	8	16	22	18	28	249
1929 . . .	26	26	14	30	17	7	10	11	9	29	41	36	256

¹ This includes 10 deaths, month unknown.

TABLE XXII. — *Mortality from Diphtheria, Massachusetts Cities, 1911-1929, per 100,000.*

CITIES.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.
Boston	17.0	13.8	22.2	23.1	29.1	26.0	37.8	30.2	21.0	19.8	20.1	20.7	23.2	22.9	12.9	6.8	7.4	7.9	6.5
Brockton	8.6	8.4	26.6	22.8	20.8	9.5	4.7	3.1	12.1	10.6	10.6	9.1	9.1	12.2	7.7	1.5	-	3.1	3.1
Brookline (town)	6.9	3.3	3.2	3.1	11.9	-	-	5.5	2.7	2.6	5.2	10.0	2.4	-	-	-	-	-	-
Cambridge	38.8	23.4	13.0	14.8	26.7	13.7	14.6	10.9	4.6	5.4	9.8	7.9	9.5	7.6	5.8	.8	-	7.2	.8
Chelsea	11.4	8.0	7.6	14.4	2.3	13.9	27.7	9.3	11.5	9.2	13.5	4.4	4.3	6.4	4.2	4.1	6.1	-	2.0
Chicopee	18.8	14.5	21.0	81.5	29.6	34.7	24.2	32.0	22.5	21.0	26.4	26.2	15.0	24.4	4.7	13.9	4.5	6.6	8.6
Everett	17.4	-	2.8	21.6	15.9	5.2	30.9	5.1	47.6	24.8	7.4	7.3	7.3	2.4	2.4	-	-	-	4.6
Fall River	23.1	27.0	25.2	21.8	24.9	16.1	30.9	22.1	20.6	32.1	18.7	41.7	16.6	14.1	11.6	13.7	13.6	3.0	10.3
Fitchburg	41.8	12.9	20.5	25.4	70.5	52.5	34.7	14.8	24.5	12.1	12.0	18.9	23.4	18.5	27.4	11.3	6.7	8.8	8.8
Haverhill	13.2	17.2	14.7	2.2	26.2	29.6	25.2	17.1	26.2	18.7	19.1	15.5	9.9	20.0	6.1	6.2	6.3	2.2	4.4
Holyoke	18.9	18.6	45.2	33.2	21.4	16.5	33.1	9.9	18.3	10.0	11.6	34.9	23.2	14.9	14.9	22.9	8.2	6.5	6.5
Lawrence	19.5	12.5	11.5	39.1	36.5	26.3	14.1	19.3	20.2	23.4	20.2	17.0	24.5	33.1	19.3	8.6	8.6	6.4	5.4
Lynn	15.9	14.9	32.6	24.1	23.0	41.1	25.6	16.2	22.2	17.7	32.1	14.3	14.4	9.0	3.6	5.5	16.4	12.9	15.7
Lowell	14.3	15.2	18.2	25.3	23.0	20.7	16.4	8.2	30.4	28.1	28.9	12.9	8.9	7.8	8.7	8.6	18.1	6.6	17.9
Malden	17.5	10.7	38.0	39.4	47.0	22.4	45.0	40.8	18.3	40.5	30.1	37.7	25.6	23.3	15.4	11.5	3.8	3.7	14.8
Medford	24.0	-	10.7	23.8	3.3	3.1	11.6	19.2	7.9	2.5	12.0	7.0	4.5	8.6	-	4.0	-	3.8	1.8
New Bedford	10.0	20.5	32.3	20.4	23.4	9.8	13.9	17.0	18.3	27.3	22.4	19.1	7.5	11.7	7.5	15.1	16.0	11.8	9.3
Newton	4.9	2.4	2.4	9.4	16.1	2.3	20.2	26.6	19.6	12.8	20.8	16.1	11.8	3.8	1.9	1.8	-	1.7	1.7
Pittsfield	20.6	29.4	15.2	16.7	5.0	2.3	17.2	4.9	4.8	-	5.8	18.1	31.0	6.5	6.4	4.2	6.1	4.0	3.9
Quincy	19.6	8.1	20.6	17.3	2.4	2.4	12.3	13.1	10.5	8.2	6.9	1.9	7.1	10.3	1.6	4.8	1.5	1.5	-
Revere	5.0	9.4	4.4	12.4	19.7	2.4	11.1	10.8	14.0	13.7	6.7	6.5	12.6	6.1	3.0	-	-	-	-
Salem	30.9	4.9	20.2	7.9	8.0	5.2	5.0	9.8	40.5	28.2	7.0	35.1	51.0	18.7	32.7	30.3	25.6	9.3	41.8
Somerville	22.6	18.4	14.4	29.3	22.9	26.0	30.1	26.3	11.9	23.5	29.6	19.8	15.5	15.3	4.0	10.0	4.9	6.8	4.8
Springfield	9.7	15.8	16.3	10.9	9.6	16.4	54.5	25.6	19.7	12.2	17.3	17.7	14.5	17.8	4.2	4.1	12.2	19.4	14.5
Taunton	17.3	11.4	11.3	5.6	5.5	22.0	8.2	2.7	2.7	10.7	13.2	7.9	2.6	-	2.5	2.5	2.5	5.4	2.4
Waltham	10.6	17.3	23.8	23.5	26.5	19.8	16.4	6.5	12.9	35.2	31.2	18.3	35.9	26.3	2.9	2.8	16.5	5.4	2.6
Worcester	24.7	20.8	23.0	11.2	12.8	14.3	23.4	12.0	10.1	7.7	15.9	15.7	20.3	22.2	15.7	8.8	7.2	6.6	8.5

MALARIA PREVENTION.

WILSON G. SMILLIE, M.D., *Consulting Epidemiologist.*

Malaria was formerly one of the common communicable diseases of the Commonwealth. It has almost entirely disappeared in Massachusetts, due to economic improvement, to drainage, to decrease in immigration from southern Europe, to better clinical knowledge of the disease and other factors.

The type of mosquito which transmits the disease has not disappeared. If the malaria parasite is introduced into the State by migratory laborers, who may be living in construction camps, in proximity to anopheles breeding places and without adequate protection from mosquitoes, then the stage is set perfectly for an epidemic of malaria which may occur in the camp, with explosive suddenness. It is probable that endemic malaria would become seeded down in the surrounding community following such an outbreak.

The construction of the Swift-Wachusett tunnel of necessity created conditions which might result in the introduction of malaria into the area. In order to prevent such an occurrence, a careful watch was kept on the seven construction camps during the summer months of 1929.

A weekly record of the personnel of the camps was furnished the State Health Commissioner by the State Engineer, Mr. Winsor. These data gave the place of birth, the place of last employment and the previous history of malaria of each employee. Records of all illness in the camps was kept by the representatives of the State Engineer and all illness was reported at once to the camp physician. The camps were all screened before the mosquito season began, not only the bunk houses but the mess hall, and all other buildings were well protected with fine mesh screens. The camp tender was required to keep the screen doors and windows in good repair.

Beginning June 22nd, surveys were made of mosquito breeding places in the environs of the camps and larvæ-catching stations were established. Search for adult mosquitoes was made in the bunk houses, mess hall and outhouses and in the stables. Inspection of the effectiveness of screening and also the general sanitation was made at each visit.

The mosquito surveys were made on June 22nd, July 15th, August 12th, and September 9th. On each visit a few anopheles breeding places were discovered and the conditions corrected. The season was dry and the density of anopheles was never great. We anticipated that the settling basin at Camp 5 would give serious trouble, for it offered ideal conditions for anopheles breeding. Larvæ were not prevalent here until the last inspection when enormous numbers of anopheles larvæ were found. In view of the lateness of the season and the preponderance of *A. punctipennis* larvæ, it was not necessary to drain the pond.

The camp tenders were careful in protecting the screens. A few anopheles mosquitoes were found in the stables and outhouses on each visit, but *anopheles quadrimaculatus*, which is the most important vector of malaria in the United States, was never found in the sleeping quarters, and no cases of malaria occurred in the camps during the summer.

Cases and Deaths, with Case and Death Rates per 100,000¹ Population for all Reportable Diseases during the Year 1929.

DISEASES.	Cases.	Case Rate per 100,000 Population.	Deaths.	Death Rate per 100,000 Population.	Fatality Rate (Per Cent).
Actinomycosis	4	.1	2	.04	50.0
Anterior Poliomyelitis	119	2.7	21	.5	17.6
Anthrax	11	.3	3	.1	27.3
Chicken pox	9,668	220.7	5	.1	.1
Diphtheria	4,255	97.1	256	5.8	6.0
Dog Bite	4,635	105.8	—	—	—
Dysentery	24	.5	3	.1	12.5
Encephalitis Lethargica	54	1.2	44	1.0	81.5
Epidemic Cerebrospinal Meningitis	167	3.8	79	1.8	47.3
German Measles	904	20.6	—	—	—
Gonorrhea	4,410	100.7	13	.3	.3
Hookworm	—	—	—	—	—
Influenza	10,166	232.1	1,185	27.1	11.7
Leprosy	1	.02	—	—	—
Malaria	27	.6	3	.1	11.1
Measles	14,925	340.7	121	2.8	.8
Mumps	4,245	96.9	1	.02	.02
Ophthalmia Neonatorum ²	1,399	31.9	—	—	—
Pellagra	8	.2	11	.3	— ³
Pneumonia, Lobar	5,287	120.7	2,202	50.3	41.6
Rabies	2	.04	2	.04	100.0
Scarlet Fever	9,975	227.7	71	1.6	.7
Septic Sore Throat	271	6.2	52	1.2	19.2
Smallpox	273	6.2	1	.02	.4
Syphilis	1,531	35.0	133	3.0	8.7
Tetanus	23	.5	19	.4	82.6
Trachoma	74	1.7	—	—	—
Trichinosis	16	.4	—	—	—
Tuberculosis, Pulmonary	4,538	103.6	2,561	58.5	56.4
Tuberculosis, Other Forms	649	14.8	361	8.2	55.6
Tuberculosis, Hilum	516	11.8	—	—	—
Typhoid Fever	307	7.0	42	1.0	13.7
Whooping Cough	7,708	176.0	137	3.1	1.8
Total	86,192	1,967.7	7,328	167.3	8.5

¹ Population, 1929, 4,380,463.² Includes suppurative conjunctivitis.³ Incompletely reported.

Cases and Deaths from Communicable Diseases by Months, 1929.

	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUGUST.		SEP-TEMBER.		OCTOBER.		NO. VEMBER.		DECEMBER.		TOTAL.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Actinomycosis	4	2	3	2	8	2	1	2	1	1	4	1	1	1	2	1	21	1	31	5	19	4	9	2	4	2
Anterior Poliomyelitis	2	1	2	2	1	2	3	2	1	1	4	1	1	1	11	2	1	1	1	1	1	4	1	1	21	1
Anthrax	1696	883	743	3	918	1	768	1	918	1	958	1	412	1	132	1	127	1	500	1	1306	1	1495	1	9668	5
Chicken Pox	490	26	331	14	344	30	360	30	315	17	270	7	239	10	179	11	222	9	432	29	556	41	517	36	4355	256
Diphtheria	216	254	297	2	479	1	400	5	479	1	608	6	494	6	541	1	413	383	383	3	318	6	232	3	4335	3
Dog Bite	2	6	2	4	7	2	3	2	7	7	2	2	2	2	3	4	4	1	5	2	3	4	5	2	24	4
Dysentery	9	6	8	3	3	2	3	2	7	7	2	2	2	2	3	4	4	3	5	2	3	4	5	2	54	4
Encephalitis Lethargica	10	6	10	4	15	8	24	10	18	8	19	8	15	10	13	5	9	2	9	7	13	7	12	4	167	79
Epidemic Cerebrospinal Meningitis	42	67	271	2	371	2	148	10	196	2	126	30	30	2	13	1	18	1	22	2	35	34	34	1	904	13
German Measles	396	537	320	130	386	78	274	59	390	2	370	2	271	2	518	1	372	1	436	2	335	1	400	1	4410	13
Gonorrhea	7995	1575	320	130	386	78	274	59	390	2	370	2	271	2	518	1	372	1	436	2	335	1	400	1	4410	13
Hookworm	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Influenza	552	889	391	253	695	1342	1373	13	1005	9	648	3	303	3	139	3	106	2	294	2	385	3	1177	2	14925	1185
Leptosy	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Malaria	2701	41	1517	19	1542	11	1922	9	2589	19	2142	8	897	2	139	3	106	2	294	2	385	3	1177	2	27	3
Measles	461	359	440	121	519	447	447	86	519	429	429	8	227	2	103	3	67	2	222	2	409	5	562	6	14925	121
Mumps	165	120	120	2	121	2	86	1	129	103	103	83	129	1	129	1	103	1	114	1	129	1	117	1	1399	1
Opthalmia Neonatorum	552	889	391	253	695	1342	1373	13	1005	9	648	3	303	3	139	3	106	2	294	2	385	3	1177	2	27	3
Pellagra	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	8
Pneumonia, Lobar	1342	889	391	253	695	1342	1373	13	1005	9	648	3	303	3	139	3	106	2	294	2	385	3	1177	2	5287	2202
Rabies	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Scarlet Fever	1232	9	1057	16	1373	13	1198	12	1005	9	648	3	303	3	139	3	106	2	294	2	385	3	1177	2	9975	71
Septic Sore Throat	39	4	25	10	19	4	31	3	23	8	40	5	20	3	12	2	10	4	13	2	874	3	1177	4	271	52
Smallpox	14	7	7	1	238	6	31	7	238	6	6	1	1	1	1	1	1	1	1	1	1	1	1	1	273	1
Syphilis	135	8	89	13	147	10	114	13	147	12	140	14	83	13	160	5	101	6	153	12	110	14	152	13	1531	133
Tetanus	2	1	2	1	1	1	4	4	2	1	2	2	1	2	2	2	4	2	3	3	2	1	1	1	23	19
Trachoma	5	4	4	1	8	1	4	4	8	1	9	1	1	1	10	1	2	2	6	6	8	6	6	6	74	1
Trichinosis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16	1
Tuberculosis, Pulmonary	381	277	363	217	437	243	425	226	409	236	364	226	393	213	417	191	293	185	388	194	353	167	315	186	4538	2561
Tuberculosis, Other	43	24	47	30	57	37	52	45	80	36	75	31	45	33	52	24	55	23	50	27	53	25	40	25	649	361
Tuberculosis, Hilum	35	1	16	2	58	3	32	1	30	5	216	29	29	14	14	16	23	16	30	17	30	17	17	17	516	516
Typhoid Fever	653	19	488	11	699	17	710	12	748	6	728	12	649	7	528	11	415	9	462	10	608	11	960	12	7708	437
Whooping Cough	18078	1512	8193	1068	7972	754	7662	610	8725	567	7514	406	4372	356	3304	317	2791	321	4504	432	5958	435	7219	550	86192	7328
Total	18078	1512	8193	1068	7972	754	7662	610	8725	567	7514	406	4372	356	3304	317	2791	321	4504	432	5958	435	7219	550	86192	7328

Index to Line Numbers in the Table of Cases and Deaths from Diseases Dangerous to the Public Health, 1929.

Abington	114	East Bridgewater	149	Lowell	8
Acton	181	East Brookfield	279	Ludlow	78
Acushnet	129	East Longmeadow	145	Lunenburg	207
Adams	61	Eastham	305	Lynn	9
Agawam	97	Easthampton	70	Lynnfield	248
Alford	346	Easton	122		
Amesbury	67	Edgartown	258	Malden	17
Amherst	113	Egremont	312	Manchester	185
Andover	69	Enfield	293	Mansfield	104
Arlington	29	Erving	250	Marblehead	84
Ashburnham	197	Essex	251	Marion	260
Ashby	277	Everett	24	Marlborough	47
Ashfield	278			Marshfield	205
Ashland	178	Fairhaven	63	Mashpee	332
Athol	82	Fall River	5	Mattapoisett	222
Attleboro	39	Falmouth	120	Maynard	88
Auburn	119	Fitchburg	22	Medfield	138
Avon	187	Florida	323	Medford	16
Ayer	169	Foxborough	121	Medway	161
		Framingham	33	Melrose	38
Barnstable	109	Franklin	94	Mendon	273
Barre	160	Freetown	224	Merrimac	190
Becket	286			Methuen	32
Bedford	231	Gardner	40	Middleborough	80
Belchertown	148	Gay Head	347	Middlefield	349
Bellingham	151	Georgetown	221	Middleton	209
Belmont	45	Gill	280	Milford	52
Berkley	259	Gloucester	35	Millbury	101
Berlin	263	Goshen	338	Millis	210
Bernardston	283	Gosnold	350	Millville	191
Beverly	37	Grafton	102	Milton	54
Billerica	115	Granby	289	Monroe	352
Blackstone	127	Granville	303	Monson	125
Blandford	324	Great Barrington	110	Montague	91
Bolton	285	Greenfield	58	Monterey	326
Boston	2	Greenwich	314	Montgomery	345
Bourne	156	Groton	180	Mount Washington	356
Boxborough	331	Groveland	194		
Boxford	302			Nahant	216
Boylston	271	Hadley	170	Nantucket	153
Braintree	56	Halifax	298	Natick	59
Brewster	288	Hamilton	195	Needham	73
Bridgewater	74	Hampden	300	New Ashford	354
Brimfield	284	Hancock	307	New Bedford	7
Brockton	13	Hanover	171	New Braintree	318
Brookfield	247	Hanson	193	New Marlborough	276
Brookline	20	Hardwick	168	New Salem	311
Buckland	229	Harvard	301	Newbury	240
Burlington	217	Harwich	198	Newburyport	53
		Hatfield	177	Newton	15
Cambridge	6	Haverhill	23	Norfolk	261
Canton	118	Hawley	334	North Adams	36
Carlisle	306	Heath	337	North Andover	98
Carver	230	Hingham	107	North Attleborough	75
Charlemont	290	Hinsdale	274	North Brookfield	157
Charlton	184	Holbrook	159	North Reading	211
Chatham	226	Holden	144	Northampton	31
Chelmsford	100	Holland	351	Northborough	203
Chelsea	19	Holliston	172	Northbridge	77
Cheshire	204	Holyoke	14	Northfield	218
Chester	228	Hopedale	152	Norton	165
Chesterfield	316	Hopkinton	176	Norwell	237
Chicopee	21	Hubbardston	272	Norwood	55
Chilmark	341	Hudson	87		
Clarksburg	255	Hull	158	Oak Bluffs	242
Clinton	57	Huntington	232	Oakham	304
Cohasset	163			Orange	130
Colrain	241	Ipswich	116	Orleans	270
Concord	92	Kingston	183	Otis	322
Conway	282			Oxford	137
Cummington	310				
		Lakeville	249	Palmer	68
Dalton	133	Lancaster	175	Paxton	296
Dana	294	Lanesborough	257	Peabody	41
Danvers	66	Lawrence	11	Pelham	309
Dartmouth	72	Lee	139	Pembroke	236
Dedham	51	Leicester	132	Pepperell	167
Deerfield	164	Lenox	166	Peru	355
Dennis	213	Leominster	34	Petersham	295
Dighton	146	Leverett	299	Phillipston	325
Douglas	188	Lexington	83	Pittsfield	18
Dover	266	Leyden	344	Plainfield	340
Dracut	99	Lincoln	245	Plainville	233
Dudley	124	Littleton	244	Plymouth	64
Dunstable	333	Longmeadow	142	Plympton	308
Duxbury	220				

Prescott	342	Southborough	199	Watertown	30
Princeton	287	Southbridge	50	Wayland	186
Provincetown	154	Southwick	254	Webster	62
		Spencer	103	Wellesley	71
Quincy	12	Springfield	4	Wellfleet	292
		Sterling	227	Wendell	320
Randolph	112	Stockbridge	215	Wenham	267
Raynham	192	Stoneham	76	West Boylston	202
Reading	79	Stoughton	86	West Bridgewater	162
Rehoboth	182	Stow	262	West Brookfield	252
Revere	28	Sturbridge	208	West Newbury	265
Richmond	297	Sudbury	235	West Springfield	48
Rochester	269	Sunderland	256	West Stockbridge	253
Rockland	90	Sutton	219	West Tisbury	335
Rockport	140	Swampscott	81	Westborough	106
Rowe	339	Swansea	141	Westfield	42
Rowley	239			Westford	143
Royalston	291	Taunton	26	Westhampton	330
Russell	243	Templeton	131	Westminster	196
Rutland	179	Tewksbury	123	Weston	155
		Tisbury	238	Westport	128
Salem	25	Tolland	353	Westwood	212
Salisbury	214	Topsfield	281	Weymouth	44
Sandisfield	313	Townsend	201	Whately	264
Sandwich	246	Truro	315	Whitman	89
Saugus	60	Tyngsborough	268	Wilbraham	173
Savoy	329	Tyringham	336	Williamsburg	206
Scituate	174			Williamstown	136
Seekonk	126	Upton	200	Wilmington	135
Sharon	147	Uxbridge	105	Winchendon	111
Sheffield	225			Winchester	65
Shelburne	234	Wakefield	46	Windsor	328
Sherborn	321	Wales	319	Winthrop	49
Shirley	189	Walpole	96	Woburn	43
Shrewsbury	93	Waltham	27	Worcester	3
Shutesbury	348	Ware	85	Worthington	317
Somerset	117	Wareham	108	Wrentham	150
Somerville	10	Warren	134		
South Hadley	95	Warwick	327	Yarmouth	223
Southampton	275	Washington	343	Tewksbury State Infirmary	357

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1929.	An- terior Poli- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	Massachusetts	4,380,463	119	21	9668	5	4255	256	167	79	904	-	4410	13
2	CITIES OF OVER 500,000.	804,840	32	9	2324	2	1194	52	37	34	94	-	2376	5
3	Boston	351,660	4	1	1233	-	393	39	37	14	40	-	425	3
4	CITIES OF OVER 150,000.	199,580	1	1	617	-	125	17	30	9	24	-	260	-
5	Worcester	152,080	3	-	616	-	268	22	7	5	16	-	165	3
6	Springfield	700,020	20	2	1361	2	885	67	19	5	153	-	575	2
7	CITIES OF 100,000-150,000.	135,820	1	-	110	-	129	14	3	-	4	-	80	-
8	Fall River	127,690	7	-	481	-	144	1	3	-	104	-	123	-
9	Cambridge	118,183	4	-	125	1	228	11	5	3	5	-	76	1
10	New Bedford	108,307	6	2	60	1	65	17	2	1	20	-	173	1
11	Lowell	106,220	-	-	452	-	195	19	3	1	13	-	80	-
12	Lynn	103,800	2	-	133	-	124	5	3	-	7	-	43	-
13	Somerville	557,440	15	2	1109	-	494	24	28	18	52	-	226	-
14	CITIES OF 50,000-100,000.	92,932	1	-	62	-	31	5	9	5	1	-	74	-
15	Lawrence	69,885	8	1	64	-	17	-	2	1	8	-	16	-
16	Quincy	64,608	-	-	133	-	25	2	-	1	8	-	15	-
17	Brockton	61,420	-	-	59	-	36	4	9	5	2	-	19	-
18	Holyoke	58,605	1	-	260	-	8	1	2	1	17	-	-	-
19	Newton	54,555	-	-	340	-	87	1	1	-	7	-	27	-
20	Medford	53,935	2	-	87	-	91	8	1	-	8	-	21	-
21	Malden	50,990	3	1	17	-	54	2	-	-	1	-	21	-
22	Pittsfield	50,510	-	-	87	-	55	1	4	5	-	-	33	-
23	Chelsea	471,157	10	2	975	-	624	34	11	1	109	-	357	1
24	CITIES AND TOWNS, 25,000-50,000.	46,655	-	-	113	-	5	-	-	-	14	-	9	-
25	Brookline	46,445	2	1	25	-	40	4	5	1	2	-	12	-
26	Chicopee	45,675	1	1	20	-	64	4	1	-	4	-	21	-
27	Fitchburg	45,467	1	-	174	-	57	2	1	-	28	-	84	-
28	Haverhill	43,630	1	-	55	-	106	2	1	-	4	-	42	-
29	Everett	43,035	3	-	78	-	220	18	2	-	2	-	70	1
30	Salem	40,950	-	-	25	-	3	1	-	-	1	-	5	-
31	Taunton	37,830	2	-	80	-	13	1	-	-	-	-	5	-
32	Waltham	36,835	-	-	46	-	51	-	-	-	-	-	62	-
33	Revere	30,010	-	-	254	-	18	-	1	-	11	-	10	-
34	Arlington	28,720	-	-	30	-	35	-	-	-	-	-	1	-
35	Watertown	25,905	-	-	75	-	12	2	-	-	42	-	36	-
36	Northampton	732,566	18	2	1565	1	458	21	25	6	319	-	244	-
37	CITIES AND TOWNS, 10,000-25,000.	24,988	-	-	87	-	4	-	-	-	-	-	-	-
38	Methuen	24,351	1	-	157	-	6	1	-	-	2	-	38	-
39	Framingham	24,041	-	-	30	-	2	-	5	1	3	-	8	-
40	Leominster	23,715	-	-	12	-	14	1	1	-	1	-	2	-
41	Gloucester	23,070	-	-	2	-	1	-	-	-	3	-	-	-
42	North Adams	22,783	1	-	17	-	18	1	3	-	6	-	23	-
43	Beverly	21,750	-	-	19	-	10	-	-	-	51	-	11	-
44	Melrose	21,341	-	-	54	-	23	1	-	-	3	-	5	-
45	Attleboro	20,154	-	-	50	-	2	-	2	-	-	-	18	-
46	Gardner	20,125	-	-	107	-	21	2	-	-	2	-	6	-
47	Peabody	19,937	2	-	18	1	10	1	7	2	1	-	1	-
48	Westfield	19,824	-	-	41	-	33	2	-	-	1	-	1	-
49	Woburn	19,029	-	-	12	-	12	-	-	-	1	-	-	-
50	Weymouth	18,903	-	-	85	-	11	-	-	-	8	-	6	-
51	Belmont	17,702	4	1	10	-	29	-	-	-	3	-	-	-
52	Wakefield	17,210	1	-	42	-	6	1	-	-	-	-	5	-
53	Marlborough	16,846	-	-	4	-	10	-	-	-	-	-	-	-
54	West Springfield	16,723	1	-	92	-	7	1	-	-	6	-	8	-
55	Winthrop	16,492	1	-	8	-	9	-	-	-	-	-	6	-
56	Southbridge	16,447	-	-	11	-	2	-	-	-	-	-	-	-
57	Dedham	15,835	1	-	36	-	10	1	-	-	2	-	-	-
58	Milford	15,686	1	-	89	-	57	2	1	1	5	-	20	-
59	Newburyport	15,675	1	-	35	-	-	-	-	-	3	-	-	-
60	Milton	15,380	-	-	10	-	3	-	-	-	3	-	-	-
61	Norwood	15,305	1	-	47	-	7	1	1	-	2	-	6	-
62	Braintree	15,149	-	-	8	-	1	-	1	1	-	-	8	-
63	Clinton	15,072	-	-	86	-	9	2	1	-	1	-	3	-
64	Greenfield	14,456	-	-	35	-	2	-	-	-	2	-	5	-
65	Natick	14,252	-	-	6	-	7	-	-	-	15	-	4	-
66	Saugus	13,975	1	-	5	-	10	1	-	-	-	-	-	-
67	Adams	13,491	-	1	10	-	13	-	-	-	-	-	-	-
68	Webster	13,287	-	-	15	-	13	-	1	-	2	-	-	-
69	Fairhaven	13,278	-	-	22	-	3	-	1	1	-	-	3	-
70	Plymouth	12,436	-	-	15	-	6	-	-	-	6	-	1	-
71	Winchester	12,355	1	-	19	-	20	-	-	-	1	-	-	-
72	Danvers	12,194	-	-	9	-	15	2	-	-	-	-	16	-
73	Amesbury	11,971	-	-	6	-	8	1	-	-	-	-	-	-
74	Palmer													

to the Public Health, 1929.

Influenza.	Lobar Pneumonia.	Measles.	Mumps.	Ophthalmia Neonatorum.	Scarlet Fever.	Syphilis.	Tuberculosis, Pulmonary.	Tuberculosis, Other Forms.	Typhoid Fever.	Whooping Cough.												
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Line No.										
10166	1185	5287	2202	14925	121	4245	1	1399	-	9975	71	1531	133	4538	2561	649	361	307	42	7708	137	1
2360	136	1712	575	885	7	1435	-	861	-	2547	25	739	57	1414	553	230	86	60	13	1763	28	2
134	50	463	202	1922	10	130	-	102	-	724	9	148	11	350	192	40	38	16	3	851	6	3
94	24	272	112	635	3	85	-	68	-	379	8	106	8	213	119	33	28	13	2	665	4	3
40	26	191	90	1287	7	45	-	34	-	345	1	42	3	137	73	7	10	3	1	186	2	4
1528	179	864	276	2129	32	521	1	159	-	1044	9	229	16	796	411	127	68	64	10	1291	35	5
176	54	167	71	281	19	14	-	39	-	144	5	33	7	166	110	17	13	10	1	231	11	5
824	23	227	56	496	1	338	-	19	-	180	1	35	3	158	101	24	8	11	2	566	8	6
81	48	120	38	775	10	14	-	79	-	117	1	59	6	159	94	32	16	3	-	45	4	7
22	14	47	28	300	-	5	-	16	-	169	1	69	-	87	49	19	14	24	5	52	5	8
162	24	162	50	129	-	31	-	3	-	121	1	23	-	127	26	19	10	15	2	269	5	9
263	16	141	33	148	2	119	1	3	-	313	1	10	-	99	31	16	7	1	-	128	2	10
730	161	676	288	978	14	342	-	185	-	1184	4	173	13	458	177	95	39	31	6	1082	14	11
42	22	58	27	13	-	10	-	85	-	38	-	50	-	68	18	22	7	8	2	94	4	12
91	20	45	27	93	-	52	-	1	-	263	1	6	1	68	20	26	3	4	-	162	-	13
32	26	102	42	124	1	12	-	81	-	184	2	47	2	43	19	10	3	6	2	171	2	12
13	19	71	40	173	7	7	-	2	-	58	-	2	1	52	36	3	8	1	-	18	2	14
72	9	60	25	85	-	55	-	3	-	99	-	1	1	30	14	6	4	2	-	256	2	15
175	9	83	34	112	-	161	-	3	-	180	-	7	-	38	13	10	4	-	-	206	-	16
68	14	89	21	53	-	29	-	3	-	157	-	7	-	53	18	10	4	3	1	95	-	17
92	23	84	39	284	6	3	-	-	-	137	-	24	2	30	14	2	3	-	-	30	3	18
145	19	84	33	41	-	13	-	7	-	68	1	29	6	76	25	6	3	7	1	50	1	19
1989	139	506	211	1491	18	508	-	26	-	1048	5	67	13	490	256	68	30	34	1	639	18	20
88	4	33	14	76	-	23	-	-	-	194	1	3	-	54	23	7	3	3	-	71	1	21
13	12	60	18	254	5	3	-	1	-	0	-	4	1	71	29	5	3	3	-	9	2	22
7	6	36	21	128	1	1	-	4	-	17	-	6	-	38	18	6	2	1	-	42	3	23
429	23	67	21	335	5	203	-	5	-	180	-	9	5	41	9	8	4	2	1	87	1	24
344	15	70	17	26	-	33	-	4	-	67	1	10	-	39	16	12	1	-	-	88	1	25
34	14	67	34	32	3	6	-	3	-	155	1	4	-	25	9	8	4	5	-	23	3	26
33	7	9	17	170	2	4	-	1	-	23	-	1	1	29	35	2	1	10	-	14	1	27
591	24	33	24	80	-	24	-	3	-	70	1	1	1	47	17	7	7	1	-	48	1	28
136	2	33	14	24	-	21	-	1	-	79	1	12	-	36	9	4	-	1	-	17	1	29
164	7	30	9	72	-	78	-	2	-	121	-	5	1	46	22	5	2	1	-	161	1	30
78	4	31	10	50	-	38	-	1	-	69	-	1	1	19	9	2	-	7	-	49	-	31
72	21	37	12	244	2	74	-	1	-	23	-	1	3	45	60	2	3	-	-	30	3	31
1810	288	732	322	3073	20	721	-	49	-	2001	11	118	8	587	302	67	42	55	7	1326	20	32
2	15	6	1	17	-	5	-	1	-	6	-	-	-	26	7	4	2	2	1	90	-	33
14	8	29	10	12	-	10	-	1	-	193	1	31	1	14	6	4	4	1	-	3	-	34
53	2	32	14	376	2	3	-	1	-	31	1	7	-	19	1	-	-	3	2	11	-	35
-	10	16	8	172	5	1	-	-	-	49	-	-	-	15	10	-	-	1	-	18	3	36
5	12	39	16	34	1	1	-	-	-	13	-	4	-	12	5	1	-	1	-	6	1	37
56	5	50	19	17	-	2	-	1	-	58	1	20	-	22	6	2	-	1	-	2	-	38
26	4	39	14	15	1	10	-	22	-	44	4	4	-	16	4	3	3	1	-	76	1	39
7	6	28	19	362	1	5	-	2	-	143	1	-	-	69	35	6	4	5	3	42	1	40
82	8	9	8	4	-	26	-	-	-	9	-	6	-	28	6	2	-	-	-	54	1	41
28	8	18	6	14	-	36	-	-	-	67	-	2	-	17	4	2	3	-	-	52	3	42
17	7	17	10	123	-	49	-	-	-	21	1	1	-	17	25	1	2	3	-	3	-	43
19	7	20	12	5	-	20	-	-	-	29	-	-	-	2	6	-	1	4	-	6	-	44
56	4	5	6	17	-	7	-	-	-	66	-	-	2	18	4	-	-	1	-	5	1	45
95	11	26	7	137	-	60	-	1	-	66	-	2	-	15	6	4	-	5	-	135	1	46
1	5	22	5	3	-	3	-	-	-	31	-	-	-	8	6	1	1	-	-	5	-	47
5	3	6	2	23	-	7	-	-	-	258	1	-	-	16	7	1	1	1	-	31	-	48
1	-	2	3	18	1	-	-	-	-	53	-	-	-	13	2	-	-	-	-	16	2	49
164	1	8	2	15	-	22	-	1	-	40	-	2	1	8	2	3	1	1	-	82	-	50
1	4	22	9	1	-	2	-	1	-	14	-	7	-	16	2	-	-	-	-	1	-	51
8	3	2	4	2	-	1	-	-	-	36	-	-	-	1	-	1	2	1	-	10	-	52
11	1	13	8	126	-	-	-	-	-	37	-	-	-	16	6	2	1	3	-	7	-	53
181	6	24	14	145	-	117	-	3	-	19	-	5	-	13	4	2	2	-	-	136	1	54
39	2	13	9	36	-	5	-	-	-	44	-	1	-	9	7	1	-	-	-	46	-	55
2	4	24	8	5	-	4	-	-	-	17	-	-	-	10	4	3	3	2	-	11	-	56
385	4	8	3	16	-	30	-	-	-	81	2	1	-	19	40	1	-	-	-	17	-	57
2	1	14	8	361	1	6	-	-	-	71	1	3	-	9	1	1	-	-	-	4	-	58
11	4	11	6	295	1	70	-	2	-	35	-	11	-	4	2	-	1	-	-	111	1	59
2	7	13	6	3	-	2	-	-	-	38	-	2	-	4	3	1	-	-	-	5	-	60
124	9	20	5	1	-	2	-	-	-	17	-	1	-	10	4	1	-	2	-	13	-	61
4	2	1	3	-	-	-	-	-	-	10	-	-	-	10	10	-	-	-	-	2	-	62
-	2	1	3	-	1	-	-	-	-	2	-	-	-	10	3	-	2	-	-	-	-	63
9	7	6	1	66	-	2	-	8	-	10	-	-	-	9	-	4	1	2	-	7	-	64
33	9	17	6	2	-	-	-	-	-	175	1	-	-	9	4	3	-	1	-	4	1	65
58	-	22	5	9	1	105	-	-	-	10	-	-	-	9	6	2	2	-	1	33	-	66
96	16	11	16	8	-	2	-	1	-	19	-	-	2	4	23	1	2	-	-	55	1	67
97	6	28	6	7	-	-	-	-	-	14	-	2	-	8	3	-	1	-	-	20	-	68
10	1	5	2	112	2	1	-	-	-	2	-	-	-	7	3	-	1	9	-	-	-	69

to the Public Health, 1929 — Continued.

Influenza.		Lobar Pneumonia.		Measles.		Mumps.		Ophthalmia Neonatorum.		Scarlet Fever.		Syphilis.		Tuberculosis, Pulmonary.		Tuberculosis, Other Forms.		Typhoid Fever.		Whooping Cough.		Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
36	4	4	2	38	15	-	-	-	-	14	-	-	-	2	3	3	-	-	-	25	-	69
6	2	4	8	114	1	-	-	-	-	51	-	3	-	6	3	-	-	-	-	1	-	70
9	1	18	5	14	25	-	-	-	-	16	-	1	-	10	-	-	-	1	-	86	-	71
1	5	8	1	70	1	-	-	2	-	10	1	-	-	4	1	-	-	-	-	4	1	72
7	3	5	4	13	2	-	-	1	-	37	-	-	-	5	2	-	-	-	-	35	1	73
2	3	11	6	2	12	-	-	-	-	15	-	1	2	30	17	3	2	1	-	35	-	74
20	4	2	3	44	12	-	-	-	-	11	-	-	-	4	1	-	-	2	-	17	-	75
25	4	11	9	11	37	-	-	1	-	19	-	1	-	6	3	1	-	-	-	4	-	76
629	125	193	141	1836	204	9	831	3	25	3	200	134	12	18	29	443	12	-	-	5	-	77
2	3	25	5	65	20	-	-	-	-	11	-	-	-	13	2	1	-	-	-	1	1	78
1	2	8	2	128	5	-	-	-	-	4	-	-	-	14	4	-	-	-	-	6	-	79
1	7	1	2	3	-	-	-	-	-	5	-	-	-	4	4	-	-	4	-	26	-	80
1	1	3	3	105	5	-	-	-	-	148	-	-	-	1	1	-	-	-	-	15	-	81
19	5	17	5	2	8	-	-	-	-	24	-	-	-	5	2	-	-	1	-	5	1	82
29	11	2	2	30	29	-	-	-	-	6	-	-	-	4	2	1	-	-	-	-	-	83
98	2	11	2	15	5	-	-	-	-	46	-	1	-	10	4	1	1	-	-	41	-	84
53	1	3	3	5	1	-	-	1	-	23	-	5	-	4	1	2	-	1	-	16	-	85
-	2	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	86
-	2	2	2	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	87
17	2	5	2	3	1	-	-	-	-	3	-	-	-	10	2	-	8	-	-	3	-	88
7	1	1	1	1	-	-	-	-	-	1	-	-	-	2	1	-	-	-	-	-	-	89
-	1	5	3	22	1	-	-	-	-	21	-	-	-	2	1	-	3	-	-	8	-	90
7	4	4	2	1	1	-	-	-	-	24	-	-	-	1	2	-	1	-	-	-	-	91
-	5	-	6	38	1	-	-	-	-	3	-	1	-	8	1	2	-	-	-	-	-	92
97	1	9	3	86	1	-	-	-	-	14	13	-	-	2	2	1	-	-	-	2	-	93
-	-	-	-	1	-	-	-	-	-	2	1	-	-	1	1	-	-	-	-	6	-	94
4	4	7	4	149	3	-	-	1	-	17	-	-	-	5	-	-	-	-	-	2	-	95
42	-	5	1	53	2	-	-	-	-	17	-	-	-	4	3	-	1	-	-	5	-	96
-	-	6	2	1	18	-	-	-	-	18	-	3	-	5	1	1	-	-	-	1	-	97
-	2	-	1	39	1	-	-	-	-	49	-	-	-	2	1	-	-	-	-	8	-	98
14	3	-	2	5	7	-	-	-	-	6	1	-	-	3	-	-	-	-	-	-	-	99
-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	-	100
9	3	2	1	170	1	-	-	-	-	9	-	-	-	5	1	1	1	-	-	5	-	101
6	-	10	4	13	3	-	-	1	-	11	-	-	-	5	-	1	1	-	-	27	-	102
-	-	3	4	-	-	-	-	-	-	-	-	-	-	-	27	-	-	-	-	-	-	103
3	1	4	1	35	13	-	-	-	-	3	-	-	-	4	3	-	-	-	-	5	-	104
2	4	4	1	16	6	-	-	1	-	25	-	-	-	4	4	1	-	-	-	11	-	105
1	1	8	4	12	-	-	-	-	-	5	-	-	-	7	1	-	-	-	-	1	-	106
5	2	3	12	8	36	-	-	-	-	8	-	-	-	4	11	-	1	-	-	-	-	107
5	9	5	5	2	5	-	-	-	-	31	-	1	-	2	3	-	2	-	-	16	-	108
-	1	1	1	50	1	-	-	1	-	7	-	-	-	5	3	-	-	-	-	5	-	109
13	5	6	9	3	2	-	-	-	-	26	-	-	-	1	3	-	1	-	-	16	-	110
1	7	-	3	4	-	-	-	2	-	8	-	-	-	3	1	-	1	-	-	5	-	111
36	5	3	3	7	4	-	-	-	-	18	-	-	-	6	1	1	-	-	-	-	-	112
2	-	2	-	119	3	-	-	1	-	22	-	-	-	2	-	-	-	-	-	82	-	113
3	4	-	2	-	-	-	-	-	-	26	-	-	-	1	2	-	-	-	-	1	-	114
23	3	8	2	65	4	-	-	1	-	20	-	-	-	1	4	-	-	-	-	4	-	115
-	4	-	1	5	2	-	-	-	-	9	-	-	-	5	2	-	1	-	-	1	-	116
6	1	1	5	6	43	-	-	-	-	6	-	-	-	9	5	3	1	6	-	3	4	117
10	1	6	2	80	1	-	-	-	-	20	-	-	-	4	1	-	-	-	-	55	1	118
6	3	-	4	12	7	-	-	-	-	17	-	-	-	6	2	-	-	1	-	33	-	119
79	5	5	4	9	4	-	-	-	-	9	1	1	-	8	8	-	1	-	-	13	-	120
11	-	8	6	134	1	-	-	-	-	45	-	-	-	8	1	-	-	-	-	4	-	121
-	-	1	1	10	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	122
6	1	1	2	5	28	-	-	-	-	3	-	-	-	1	2	1	1	-	-	1	-	123
-	2	2	5	1	-	-	-	-	-	40	1	-	-	3	7	-	1	-	-	1	-	124
-	-	-	1	-	-	-	-	-	-	16	-	-	-	3	-	-	-	-	-	-	-	125
1	1	2	4	61	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	126
574	75	78	101	1583	180	-	-	1	-	3	-	18	5	2	1	5	13	12	1	185	2	127
-	-	-	-	63	-	-	-	-	-	5	-	-	-	4	3	-	-	-	-	3	1	128
218	3	10	3	1	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	129
-	-	5	4	14	10	-	-	1	-	1	-	-	-	-	-	-	1	-	-	-	-	130
-	1	-	2	3	1	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-	-	131
-	1	2	1	3	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	5	-	132
24	1	1	1	12	1	-	-	-	-	4	1	-	-	1	2	-	-	1	1	-	-	133
-	1	2	2	5	-	-	-	-	-	11	-	-	-	3	-	-	-	3	-	27	1	134
3	1	-	6	14	1	-	-	-	-	1	-	-	-	4	16	-	1	-	-	2	-	135
-	3	-	-	69	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	136
-	3	-	1	60	8	-	-	-	-	2	-	-	-	1	2	-	-	1	-	10	-	137

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS IN ORDER OF POPULATION.	Popu- lation estimated as of July 1, 1923.	An- terior Polio- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Mea- sles.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
141	Swansea	3,990	-	-	-	-	1	1	-	-	-	-	-	-
142	Longmeadow	3,910	-	-	16	-	2	-	-	-	-	-	-	-
143	Westford	3,895	-	-	31	-	-	-	-	-	1	-	-	-
144	Holden	3,810	-	-	3	-	-	-	-	-	1	-	-	-
145	East Longmeadow	3,767	-	-	1	-	2	-	-	-	-	-	-	-
146	Dighton	3,718	-	-	-	-	1	-	-	-	-	-	-	-
147	Sharon	3,646	-	-	-	-	8	1	-	-	-	-	-	-
148	Belchertown	3,589	1	-	7	-	-	-	-	-	-	-	-	-
149	East Bridgewater	3,580	-	-	-	-	-	-	-	-	-	-	-	-
150	Wrentham	3,541	-	-	19	-	-	1	-	-	-	-	2	-
151	Bellingham	3,506	-	-	-	-	1	1	-	-	-	-	-	-
152	Hopedale	3,475	-	-	5	-	-	-	-	-	-	-	-	-
153	Nantucket	3,437	1	-	3	-	4	-	-	-	-	-	-	-
154	Provincetown	3,420	-	-	3	-	-	-	-	-	-	-	-	-
155	Weston	3,411	-	-	4	-	-	-	-	-	2	-	-	-
156	Bourne	3,402	-	-	-	-	-	-	-	-	-	-	-	-
157	North Brookfield	3,399	-	-	-	-	-	-	-	-	-	-	-	-
158	Hull	3,362	-	-	-	-	-	-	-	-	-	-	-	-
159	Holbrook	3,358	-	-	8	-	-	-	-	-	1	-	-	-
160	Barre	3,308	-	-	-	-	-	-	-	-	-	-	-	-
161	Medway	3,293	-	-	-	-	1	-	-	-	-	-	-	-
162	West Bridgewater	3,290	-	-	-	-	7	-	-	-	-	-	-	-
163	Cohasset	3,134	-	-	-	-	1	-	-	-	-	-	-	-
164	Deerfield	3,100	-	-	2	-	-	-	-	-	1	-	-	-
165	Norton	3,084	-	-	-	-	1	-	-	-	-	-	-	-
166	Lenox	3,057	-	-	1	-	4	-	-	-	-	-	-	-
167	Pepperell	3,030	-	-	-	-	-	-	-	-	-	-	-	-
168	Hardwick	3,016	-	-	-	-	-	-	-	-	-	-	-	-
169	Ayer	3,015	-	-	1	-	-	-	-	-	2	-	-	-
170	Hadley	2,970	-	-	8	-	-	-	-	-	-	-	-	-
171	Hanover	2,899	-	-	9	-	5	-	-	-	-	-	-	-
172	Holliston	2,893	-	-	24	-	-	-	-	-	1	-	-	-
173	Wilbraham	2,875	-	-	-	-	-	-	-	-	-	-	-	-
174	Scituate	2,857	-	-	-	-	-	-	-	-	-	-	1	-
175	Lancaster	2,852	-	-	4	-	-	-	-	-	-	-	30	-
176	Hopkinton	2,814	-	-	-	-	-	-	-	-	-	-	-	-
177	Hatfield	2,744	-	-	5	-	1	-	-	-	1	-	2	-
178	Ashland	2,708	-	-	2	-	-	-	-	-	-	-	-	-
179	Rutland	2,635	-	-	-	-	-	-	-	-	-	-	-	-
180	Groton	2,623	-	-	1	-	-	-	-	-	-	-	-	-
181	Acton	2,566	-	-	1	-	-	-	-	-	-	-	-	-
182	Rehoboth	2,545	-	-	-	-	2	-	-	-	-	-	-	-
183	Kingston	2,511	-	-	-	-	-	-	-	-	-	-	-	-
184	Charlton	2,533	-	-	-	-	-	-	-	-	-	-	-	-
185	Manchester	2,525	1	-	1	-	-	-	-	-	-	-	-	-
186	Wayland	2,510	-	-	6	-	-	-	-	-	1	-	-	-
187	Avon	2,509	-	-	5	-	1	-	-	-	-	-	-	-
188	Douglas	2,507	-	-	-	-	2	-	-	-	-	-	1	-
189	Shirley	2,500	-	-	11	-	-	-	-	-	1	-	1	-
	Towns, 1,000-2,500.	143,085	5	1	225	-	87	6	2	-	15	-	9	-
190	Merrimac	2,485	1	1	13	-	-	-	-	-	1	-	-	-
191	Millville	2,477	-	-	-	-	-	-	-	-	-	-	-	-
192	Raynham	2,476	-	-	-	-	1	-	-	-	-	-	-	-
193	Hanson	2,370	-	-	4	-	-	-	-	-	-	-	-	-
194	Groveland	2,353	-	-	2	-	2	-	-	-	-	-	-	-
195	Hamilton	2,328	-	-	1	-	5	2	-	-	-	-	-	-
196	Westminster	2,318	-	-	12	-	-	-	-	-	-	-	-	-
197	Ashburnham	2,278	-	-	-	-	-	-	-	-	-	-	-	-
198	Harwich	2,260	-	-	-	-	-	-	-	-	-	-	-	-
199	Southborough	2,227	-	-	-	-	-	-	-	-	-	-	-	-
200	Upton	2,222	-	-	-	-	-	-	-	-	-	-	1	-
201	Townsend	2,150	-	-	14	-	1	-	-	-	-	-	-	-
202	West Boylston	2,150	-	-	21	-	-	-	-	-	-	-	1	-
203	Northborough	2,142	-	-	-	-	1	-	-	-	-	-	1	-
204	Cheshire	2,139	-	-	-	-	13	-	-	-	-	-	-	-
205	Marshfield	2,100	-	-	4	-	-	-	-	-	-	-	1	-
206	Williamsburg	2,095	-	-	6	-	9	-	-	-	-	-	-	-
207	Lunenburg	2,070	-	-	2	-	-	-	-	-	-	-	-	-
208	Sturbridge	2,065	-	-	-	-	-	-	-	-	-	-	-	-
209	Middleton	2,045	-	-	-	-	-	-	-	-	-	-	-	-
210	Millis	2,037	-	-	-	-	1	1	-	-	1	-	-	-
211	North Reading	2,012	-	-	2	-	4	-	-	-	-	-	-	-
212	Westwood	1,987	-	-	1	-	3	-	-	-	-	-	-	-
213	Dennis	1,919	-	-	-	-	1	-	-	-	-	-	-	-

to the Public Health, 1929 — Continued.

Influenza.	Lobar Pneumonia.	Measles.	Mumps.	Ophthalmia Neonatorum.	Scarlet Fever.	Syphilis.	Tuberculosis, Pulmonary.	Tuberculosis, Other Forms.	Typhoid Fever.	Whooping Cough.	Line No.
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	2	2	2	257	—	—	—	—	—	—	141
—	1	2	—	62	2	—	—	—	—	—	142
—	1	5	1	1	—	—	—	—	—	—	143
3	2	2	41	—	—	—	—	—	—	—	144
—	1	3	20	—	—	—	—	—	—	—	145
22	1	2	10	39	2	—	—	—	—	—	146
16	3	3	13	2	—	—	1	17	2	14	147
—	3	1	8	—	—	—	—	—	2	5	148
124	4	11	5	5	—	—	—	—	1	1	149
—	1	4	—	—	—	—	—	—	—	—	150
—	—	2	63	3	—	—	—	—	—	—	151
5	—	6	1	—	—	—	—	—	1	—	152
—	3	3	1	1	—	—	—	—	—	2	153
44	2	2	6	5	—	—	—	—	—	15	154
—	1	1	1	—	—	—	—	—	—	—	155
—	1	—	5	—	—	—	1	—	—	—	156
—	1	—	—	—	—	—	—	—	—	—	157
1	1	—	3	—	—	—	—	—	—	—	158
2	1	—	1	—	—	—	—	—	—	10	159
—	4	6	—	—	—	—	—	—	—	—	160
—	—	—	—	—	—	—	—	—	—	—	161
—	2	—	3	—	—	—	—	—	—	—	162
21	1	1	1	—	—	—	—	—	—	2	163
1	1	3	202	66	—	—	—	—	—	13	164
1	4	3	20	—	—	—	—	—	—	—	165
6	2	1	30	—	—	—	—	—	4	—	166
—	—	2	140	1	—	—	—	—	—	—	167
—	—	1	8	8	—	—	—	—	—	2	168
12	6	7	9	10	—	—	—	—	—	6	169
9	2	2	4	—	—	—	—	—	—	—	170
1	2	1	1	—	—	—	—	—	—	—	171
19	3	1	8	1	—	—	1	—	—	1	172
—	2	—	79	—	—	—	—	—	—	—	173
—	1	—	—	—	—	—	—	—	—	—	174
1	3	2	107	1	2	—	15	—	—	1	175
—	1	—	—	—	—	—	—	—	—	—	176
—	3	1	4	2	—	—	—	—	1	—	177
—	—	—	—	—	—	—	—	—	—	—	178
—	1	1	—	—	—	—	—	—	—	—	179
15	1	1	3	—	—	—	—	—	1	—	180
—	2	1	—	—	—	—	—	—	—	—	181
10	1	1	—	—	—	—	—	—	—	—	182
2	—	2	—	—	—	—	—	—	—	—	183
—	—	—	79	—	—	—	—	—	—	—	184
—	1	1	4	—	—	—	—	—	—	—	185
—	2	5	2	—	—	—	—	—	—	6	186
7	—	1	114	1	—	—	—	—	—	11	187
—	9	2	2	—	—	—	—	—	—	—	188
192	56	43	739	5	83	5	290	3	2	1	189
—	4	—	1	—	19	—	34	—	—	—	190
—	—	1	—	—	—	—	—	—	—	—	191
—	—	1	—	—	—	—	—	—	—	—	192
2	2	1	3	—	—	—	—	—	—	—	193
—	—	—	—	—	—	—	—	—	—	—	194
4	—	—	3	—	16	—	10	—	—	9	195
—	2	—	1	—	3	1	3	—	—	6	196
—	—	—	8	—	—	—	—	—	—	—	197
—	1	—	—	—	—	—	—	—	—	—	198
—	—	—	—	—	—	—	—	—	—	—	199
22	1	5	42	—	—	—	—	—	—	1	200
—	—	—	1	—	—	—	—	—	—	—	201
1	1	2	2	—	—	—	13	—	—	3	202
1	2	—	—	—	—	—	—	—	—	—	203
10	1	1	11	—	2	—	—	—	—	—	204
—	—	—	12	—	—	—	—	—	—	—	205
—	—	—	9	—	—	—	12	—	—	—	206
—	—	—	—	—	—	—	—	—	—	—	207
—	1	—	—	—	—	—	6	—	—	—	208
—	—	—	—	—	—	—	—	—	—	—	209
1	—	1	—	—	—	—	12	—	—	4	210
—	—	2	—	—	—	—	7	—	—	—	211
—	3	—	28	—	—	—	1	—	—	—	212

to the Public Health, 1929 — Continued.

Influenza.	Lobar Pneumonia.	Measles.	Mumps.	Ophthalmia Neonatorum.	Scarlet Fever.	Syphilis.	Tuberculosis, Pulmonary.	Tuberculosis, Other Forms.	Typhoid Fever.	Whooping Cough.	
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
8	1	3	-	8	-	-	-	-	-	1	-
5	1	2	4	-	-	4	-	-	-	-	-
76	2	5	2	16	3	-	-	-	-	4	-
12	3	3	2	30	17	8	1	1	-	10	-
1	3	3	1	8	1	7	-	1	-	1	-
1	1	3	-	-	-	1	-	-	-	8	-
-	1	3	-	20	-	7	-	-	-	-	-
-	1	-	-	49	-	1	-	2	1	-	-
-	-	-	-	4	-	-	-	-	-	-	-
-	2	1	2	-	-	-	-	-	-	-	-
-	-	-	-	10	-	1	-	-	-	1	1
3	-	-	-	43	-	4	-	-	-	-	-
-	-	-	-	14	4	-	-	-	-	-	-
-	1	-	1	-	1	11	-	1	1	-	-
19	-	-	-	-	1	5	-	-	-	-	-
1	-	1	1	23	-	1	-	2	-	1	-
-	1	-	1	6	3	1	-	-	-	-	-
-	1	-	1	3	-	12	1	-	-	-	-
3	3	-	-	5	-	22	-	1	-	-	-
-	-	-	5	5	-	-	-	-	-	-	-
1	2	-	1	3	-	2	-	1	-	1	-
-	-	-	-	-	-	7	-	-	-	-	-
9	2	-	2	-	-	-	-	1	-	-	-
-	2	-	-	-	-	5	-	-	-	-	-
7	1	1	1	5	2	1	-	1	-	-	-
-	-	-	-	-	1	11	-	3	-	-	-
2	-	-	-	1	-	4	-	1	-	19	-
-	-	-	1	8	-	-	-	-	-	4	-
1	-	-	1	11	-	4	-	36	4	-	-
-	-	-	1	15	-	4	-	-	3	-	-
-	-	-	1	-	-	9	-	2	1	-	-
-	1	1	2	1	-	8	1	1	2	-	-
-	2	-	-	2	-	3	-	1	-	-	-
-	1	-	2	17	-	5	1	-	-	-	-
-	1	-	2	-	-	-	-	-	-	-	-
2	-	2	1	223	1	1	2	-	1	-	-
-	2	1	-	-	1	6	-	1	1	-	-
-	-	-	-	-	-	3	-	-	-	-	-
1	-	-	-	1	-	6	-	-	-	-	-
-	1	1	-	8	2	1	-	-	1	-	-
-	-	-	-	1	-	2	-	-	-	-	-
-	1	1	-	8	2	1	-	1	-	1	-
-	1	-	1	7	-	-	-	-	-	-	-
-	2	-	-	-	-	-	-	-	-	-	-
-	2	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	2	-	-	-	-	-
-	1	-	-	15	-	2	-	-	-	-	-
168	22	14	26	239	51	40	-	11	8	1	17
1	1	4	1	52	3	1	-	1	-	-	-
-	-	-	-	-	-	1	-	1	1	-	-
-	1	-	-	19	-	-	-	-	-	-	-
-	-	-	2	9	23	4	-	1	-	1	-
4	1	-	-	-	12	-	-	1	-	-	-
12	1	3	3	5	-	1	-	-	-	-	-
1	-	1	-	-	-	1	-	-	-	-	-
3	-	-	1	11	-	-	-	-	-	-	-
-	-	-	1	25	6	-	-	-	-	-	-

Cases and Deaths from Diseases Dangerous

Line No.	CITIES AND TOWNS IN ORDER OF POPULATION.	Popu- lation esti- mated as of July 1, 1922.	An- terior Poli- mye- litis.		Chicken Pox.		Diph- theria.		Ep. Cere- bro- spinal Menin- gitis.		Ger- man Meas- les.		Gonor- rhea.	
			Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
287	Princeton	845	-	-	-	-	-	-	-	-	-	-	-	-
288	Brewster	842	-	-	1	-	-	-	-	-	-	-	-	-
289	Granby	830	-	-	-	-	-	-	-	-	-	-	-	-
290	Charlemont	824	-	-	-	-	-	-	-	-	-	-	-	-
291	Royalston	821	-	-	-	-	-	-	-	-	-	-	-	-
292	Wellfleet	756	-	-	-	-	-	-	-	-	-	-	-	-
293	Enfield	719	-	-	1	-	-	-	-	-	-	-	-	-
294	Dana	704	-	-	-	-	-	-	-	-	3	-	-	-
295	Petersham	693	-	-	-	-	-	-	-	-	-	-	-	-
296	Paxton	672	-	-	-	-	-	-	-	-	-	-	-	-
297	Richmond	666	-	-	-	-	-	-	-	-	-	-	-	-
298	Halifax	655	-	-	-	-	-	-	-	-	-	-	-	-
299	Leverett	643	-	-	-	-	1	-	-	-	1	-	-	-
300	Hampden	635	-	-	-	-	1	-	-	-	1	-	-	-
301	Harvard	600	-	-	-	-	1	-	-	-	1	-	-	-
302	Boxford	580	-	-	-	-	-	-	-	-	-	-	-	-
303	Granville	575	-	-	-	-	-	-	-	-	-	-	-	-
304	Oakham	559	-	-	-	-	-	-	-	-	-	-	-	-
305	Eastham	545	-	-	2	-	-	-	-	-	-	-	-	-
306	Carlisle	544	-	-	1	-	-	-	-	-	-	-	-	-
307	Hancock	544	-	-	-	-	-	-	-	-	-	-	-	-
308	Plympton	541	-	-	-	-	-	-	-	-	-	-	-	-
309	Pelham	528	-	-	-	-	-	-	-	-	-	-	-	-
310	Cummington	525	-	-	-	-	-	-	-	-	-	-	-	-
311	New Salem	523	-	-	-	-	-	-	-	-	-	-	-	-
312	Egremont	503	-	-	-	-	-	-	-	-	-	-	-	-
313	Sandisfield	497	-	-	-	-	-	-	-	-	-	-	-	-
314	Greenwich	492	-	-	2	-	1	-	-	-	-	-	-	-
315	Truro	470	-	-	-	-	-	-	-	-	-	-	-	-
316	Chesterfield	445	-	-	-	-	-	-	-	-	-	-	-	-
317	Worthington	445	-	-	-	-	-	-	-	-	-	-	-	-
318	New Braintree	444	-	-	-	-	-	-	-	-	-	-	-	-
319	Wales	443	-	-	-	-	-	-	-	-	-	-	-	-
320	Wendell	439	-	-	-	-	-	-	-	-	-	-	-	-
321	Sherborn	423	-	-	14	-	-	-	-	-	-	-	-	-
322	Otis	421	-	-	-	-	-	-	-	-	-	-	-	-
323	Florida	413	-	-	-	-	-	-	-	-	-	-	-	-
324	Blandford	407	-	-	-	-	-	-	-	-	-	-	-	-
325	Phillipston	405	-	-	-	-	-	-	-	-	-	-	-	-
326	Monterey	399	-	-	-	-	-	-	-	-	-	-	-	-
327	Warwick	390	-	-	-	-	-	-	-	-	-	-	-	-
328	Windsor	378	-	-	-	-	-	-	-	-	-	-	-	-
329	Savoy	373	-	-	-	-	-	-	-	-	-	-	-	-
330	Westhampton	363	-	-	-	-	-	-	-	-	-	-	-	-
331	Boxborough	359	-	-	-	-	-	-	-	-	-	-	-	-
332	Mashpee	340	-	-	-	-	-	-	-	-	-	-	-	-
333	Dunstable	329	-	-	-	-	-	-	-	-	-	-	-	-
334	Hawley	328	-	-	-	-	1	-	-	-	-	-	-	-
335	West Tisbury	323	-	-	2	-	-	-	-	-	-	-	-	-
336	Tyringham	290	-	-	-	-	-	-	-	-	-	-	-	-
337	Heath	277	-	-	-	-	-	-	-	-	-	-	-	-
338	Goshen	272	-	-	-	-	-	-	-	-	-	-	-	-
339	Rowe	262	-	-	-	-	-	-	-	-	-	-	-	-
340	Plainfield	248	-	-	8	-	-	-	-	-	-	-	-	-
341	Chilmark	240	-	-	-	-	-	-	-	-	-	-	-	-
342	Prescott	230	-	-	-	-	-	-	-	-	-	-	-	-
343	Washington	230	-	-	12	-	-	-	-	-	-	-	-	-
344	Leyden	223	-	-	-	-	-	-	-	-	-	-	-	-
345	Montgomery	203	-	-	-	-	-	-	-	-	-	-	-	-
346	Alford	200	-	-	-	-	-	-	-	-	-	-	-	-
347	Gay Head	185	-	-	-	-	-	-	-	-	-	-	-	-
348	Shutesbury	182	-	-	5	-	-	-	-	-	1	-	-	-
349	Middlefield	176	-	-	-	-	-	-	-	-	-	-	-	-
350	Gosnold	145	-	-	-	-	-	-	-	-	-	-	-	-
351	Holland	137	-	-	-	-	-	-	-	-	-	-	-	-
352	Monroe	122	-	-	-	-	-	-	-	-	-	-	-	-
353	Tolland	120	-	-	-	-	-	-	-	-	-	-	-	-
354	New Ashford	94	-	-	-	-	-	-	-	-	-	-	-	-
355	Peru	87	-	-	-	-	-	-	-	-	-	-	-	-
356	Mount Washington	50	-	-	-	-	-	-	-	-	-	-	-	-
357	Tewksbury State Infirmary	-	-	-	4	-	1	-	-	-	-	-	44	-

to the Public Health, 1929 — Concluded.

Influenza.	Lobar Pneumonia.	Measles.	Mumps.	Ophthalmia Neonatorum.	Scarlet Fever.	Syphilis.	Tuberculosis, Pulmonary.	Tuberculosis, Other Forms.	Typhoid Fever.	Whooping Cough.	Line No.	
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
-	1	-	1	-	-	-	-	-	-	-	-	287
-	3	-	1	-	-	-	-	-	-	-	-	288
-	2	1	-	-	-	-	-	-	-	-	-	289
-	2	1	-	-	-	-	-	-	-	-	-	290
-	2	-	-	11	1	-	-	-	-	-	-	291
26	-	-	-	3	-	-	-	-	-	-	-	292
24	-	-	-	2	-	-	-	-	-	-	-	293
-	-	-	-	6	-	-	-	-	-	-	-	294
-	-	1	-	4	-	-	-	-	-	-	-	295
2	2	4	-	1	-	-	-	-	-	-	-	296
-	-	1	-	5	1	-	-	-	-	-	-	297
-	1	-	-	55	-	-	-	-	-	-	-	298
-	2	1	-	-	-	-	-	-	-	-	-	299
-	-	-	-	1	-	-	-	-	-	-	-	300
-	-	-	-	2	-	-	-	-	-	-	-	301
-	-	-	-	-	-	-	-	-	-	-	-	302
1	-	-	-	-	-	-	-	-	-	-	-	303
-	2	1	-	-	-	-	-	-	-	-	-	304
-	-	-	-	-	-	-	-	-	-	-	-	305
-	-	-	-	-	-	-	-	-	-	-	-	306
-	-	-	-	-	-	-	-	-	-	-	-	307
-	-	-	-	-	-	-	-	-	-	-	-	308
2	1	1	-	-	-	-	-	-	-	-	-	309
-	-	-	-	-	-	-	-	-	-	-	-	310
-	-	-	-	-	-	-	-	-	-	-	-	311
9	-	-	-	2	1	-	-	-	-	-	-	312
16	1	-	-	5	-	-	-	-	-	-	-	313
59	1	1	-	4	-	-	-	-	-	-	-	314
7	1	-	-	2	-	-	-	-	-	-	-	315
-	-	-	-	2	-	-	-	-	-	-	-	316
-	-	-	-	1	-	-	-	-	-	-	-	317
-	-	-	-	-	-	-	-	-	-	-	-	318
-	-	-	-	-	-	-	-	-	-	-	-	319
-	-	-	-	-	-	-	-	-	-	-	-	320
-	-	-	-	-	-	-	-	-	-	-	-	321
-	-	-	-	-	-	-	-	-	-	-	-	322
-	-	-	-	-	-	-	-	-	-	-	-	323
-	1	-	-	-	-	-	-	-	-	-	-	324
-	-	-	-	-	-	-	-	-	-	-	-	325
-	-	-	-	-	-	-	-	-	-	-	-	326
-	-	-	-	-	-	-	-	-	-	-	-	327
-	-	-	-	-	-	-	-	-	-	-	-	328
-	-	-	-	-	-	-	-	-	-	-	-	329
-	-	1	-	-	-	-	-	-	-	-	-	330
-	-	-	-	-	-	-	-	-	-	-	-	331
-	-	-	-	-	-	-	-	-	-	-	-	332
-	-	-	-	-	-	-	-	-	-	-	-	333
-	-	-	-	-	-	-	-	-	-	-	-	334
-	-	-	-	-	-	-	-	-	-	-	-	335
-	-	-	-	-	-	-	-	-	-	-	-	336
-	-	-	-	-	-	-	-	-	-	-	-	337
-	-	-	-	-	-	-	-	-	-	-	-	338
-	-	-	-	-	-	-	-	-	-	-	-	339
-	-	-	-	-	-	-	-	-	-	-	-	340
-	-	-	-	-	-	-	-	-	-	-	-	341
-	-	-	-	-	-	-	-	-	-	-	-	342
-	-	-	-	-	-	-	-	-	-	-	-	343
-	-	-	-	-	-	-	-	-	-	-	-	344
-	-	-	-	-	-	-	-	-	-	-	-	345
-	1	-	-	-	-	-	-	-	-	-	-	346
-	-	-	-	-	-	-	-	-	-	-	-	347
1	-	1	-	-	-	-	-	-	-	-	-	348
-	-	-	-	-	-	-	-	-	-	-	-	349
-	-	-	-	-	-	-	-	-	-	-	-	350
-	-	-	-	-	-	-	-	-	-	-	-	351
-	-	-	-	-	-	-	-	-	-	-	-	352
-	-	-	-	-	-	-	-	-	-	-	-	353
-	-	-	-	-	-	-	-	-	-	-	-	354
-	-	-	-	-	-	-	-	-	-	-	-	355
-	-	-	-	-	-	-	-	-	-	-	-	356
52	4	6	10	50	8	-	-	-	-	-	-	357

In addition to the foregoing there occurred 4 cases of *actinomycosis* with 2 deaths:

	Cases.	Deaths.
Boston	1	2
Bridgewater	1	-
Lowell	1	-
Shelburne	1	-

11 cases of *anthrax* with 3 deaths:

	Cases.	Deaths.
Clinton	1	1
Haverhill	3	-
Lowell	1	-
Lynn	2	1
Peabody	2	1
Revere	1	-
Salem	1	-

4,635 cases of dog-bite:

	Cases.	Deaths.
Adams	7	-
Agawam	7	-
Amesbury	8	-
Amherst	14	-
Andover	3	-
Arlington	58	-
Athol	2	-
Attleboro	46	-
Auburn	6	-
Barnstable	6	-
Bellingham	2	-
Belmont	35	-
Beverly	11	-
Billerica	3	-
Boston	1,460	-
Boylston	6	-
Braintree	21	-
Bridgewater	5	-
Brockton	25	-
Brookfield	3	-
Brookline	31	-
Cambridge	283	-
Canton	16	-
Chelmsford	8	-
Chelsea	79	-
Chicopee	36	-
Clinton	14	-
Cohasset	1	-
Concord	4	-
Danvers	22	-
Dartmouth	10	-
Dedham	3	-
Dennis	2	-
Dighton	1	-
Duxbury	3	-
East Bridgewater	4	-
Easthampton	6	-
Easton	6	-
Everett	5	-
Fairhaven	31	-
Fall River	8	-
Falmouth	115	-
Fitchburg	16	-
Foxborough	18	-
Frammingham	12	-
Franklin	29	-
Freetown	15	-
Gardner	1	-
Georgetown	2	-
Gloucester	4	-
Great Barrington	32	-
Greenfield	1	-
Greenwich	29	-
Groveland	1	-
Hamilton	2	-
Hanson	1	-
Hatfield	4	-
Haverhill	4	-
Hingham	71	-
Holbrook	4	-
Holden	1	-
Holyoke	3	-
Hudson	6	-
Ipswich	5	-
Lancaster	5	-
Lawrence	1	-
Leicester	91	-
Lenox	4	-
Leominster	3	-
Lexington	7	-
	26	-

	Cases.	Deaths.
Lincoln	1	-
Littleton	1	-
Longmeadow	2	-
Lowell	211	-
Ludlow	7	-
Lunenburg	3	-
Lynn	179	-
Malden	62	-
Manchester	2	-
Mansfield	14	-
Marion	2	-
Marlborough	13	-
Mattapoisett	10	-
Maynard	1	-
Medfield	1	-
Medford	51	-
Melrose	18	-
Merrimac	4	-
Methuen	24	-
Milford	42	-
Millbury	14	-
Millis	15	-
Milton	10	-
Montague	1	-
Needham	29	-
New Bedford	74	-
New Marlborough	2	-
Newburyport	16	-
Newton	43	-
North Adams	2	-
North Andover	1	-
North Attleborough	1	-
North Reading	1	-
Northampton	10	-
Northbridge	14	-
Norton	4	-
Norwood	7	-
Oxford	2	-
Palmer	2	-
Peabody	51	-
Pelham	2	-
Pittsfield	12	-
Quincy	42	-
Randolph	10	-
Revere	51	-
Rockport	6	-
Salem	6	-
Sandwich	1	-
Saugus	15	-
Sharon	13	-
Sherborn	2	-
Shirley	1	-
Somerville	88	-
Southbridge	5	-
Southwick	1	-
Spencer	5	-
Springfield	159	-
Stoneham	2	-
Swampscott	30	-
Taunton	21	-
Uxbridge	1	-
Wakefield	1	-
Walpole	1	-
Waltham	21	-
Wayland	6	-
Wellesley	15	-
West Boylston	4	-
West Bridgewater	2	-
West Springfield	1	-
Westfield	8	-
Westford	2	-
Weston	4	-
Westport	3	-
Westwood	1	-
Weymouth	7	-
Wilbraham	1	-
Williamsburg	1	-
Wilmington	3	-
Winchester	20	-
Winthrop	50	-
Woburn	7	-
Worcester	235	-
Wrentham	14	-

24 cases of *dysentery* with 3 deaths:

	Cases.	Deaths.
Boston	4	1
Chelsea	2	-
Lowell	3	-

	Cases.	Deaths.
Waltham	1	-
Wellesley	3	-
Worcester	11	2

54 cases of *encephalitis lethargica*
with 44 deaths:

Adams	-	1
Andover	1	-
Arlington	1	1
Boston	12	7
Brookline	1	-
Cambridge	3	1
Chelsea	1	1
Danvers	-	1
East Bridgewater	-	1
Everett	1	-
Framingham	1	1
Haverhill	2	2
Holyoke	-	1
Lawrence	1	2
Lowell	3	3
Lynn	1	-
Marlborough	3	2
Melrose	1	-
Methuen	1	-
Milford	1	1
Newton	1	2
North Adams	1	-
Northampton	4	3
Pittsfield	1	1
Plainville	-	1
Salem	2	1
Springfield	1	-
Taunton	-	1
Tewksbury State Infirmary	-	1
Uxbridge	-	1
Waltham	1	1
Warren	1	-
Westfield	-	1
Winchendon	-	1
Worcester	7	6

1 case of *leprosy*:

Boston	1	-
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27 cases of *malaria* with 3 deaths:

Arlington	2	-
Boston	1	-
Braintree	1	-
Chelsea	12	1
Danvers	1	-
Everett	3	-
Foxborough	1	-
Holyoke	1	-
Lynn	-	1
Malden	2	1
Marlborough	1	-
Taunton	1	-
Winthrop	1	-

8 cases of *pellagra* with 11 deaths:

Beverly	-	1
Boston	5	4
Bridgewater	-	1
Danvers	-	1
Lawrence	1	-
Milford	-	1
New Bedford	1	1
Walpole	-	1
Worcester	1	1

2 cases of *rabies* with 2 deaths:

Mendon	1	1 ¹
Worcester	1	1

271 cases of *septic sore throat* with
52 deaths:

Amesbury	6	-
Amherst	2	-
Arlington	2	-
Belmont	3	2
Beverly	5	-
Boston	122	9
Brockton	1	1
Brookline	2	-
Cambridge	9	2
Charlton	12	-

	Cases.	Deaths.
Chelsea	1	-
Chicopee	1	-
Danvers	3	-
Dracut	-	1
Easton	1	-
Fall River	4	3
Fitchburg	1	-
Framingham	1	-
Greenfield	1	-
Hanson	1	-
Haverhill	11	2
Holyoke	2	1
Lawrence	1	-
Lee	1	-
Leominster	2	1
Lexington	1	-
Lowell	3	1
Lynn	11	3
Malden	3	-
Marblehead	1	-
Marlborough	-	1
Marshfield	2	-
Medford	2	1
Medway	-	1
Melrose	2	1
Methuen	3	1
Needham	3	1
New Bedford	1	-
Newton	2	1
Northbridge	1	-
Pittsfield	3	4
Plymouth	5	1
Quincy	-	2
Randolph	-	1
Revere	2	1
Rockport	-	1
Salem	-	1
Saugus	1	1
Somerville	2	-
Springfield	2	2
Stockbridge	1	-
Taunton	1	-
Webster	2	-
Westfield	4	-
Weston	1	-
Westport	1	1
Williamstown	6	-
Winchester	2	-
Winthrop	2	-
Worcester	6	4

273 cases of *smallpox* with 1 death:

Boston	7	1
Bourne	1	-
Brockton	2	-
Brookline	1	-
Chicopee	1	-
Gardner	13	-
Hanover	1	-
Hanson	1	-
Lakeville	1	-
Malden	1	-
Medford	1	-
Middleborough	223	-
Natick	1	-
Petersham	1	-
Rochester	1	-
Somerville	1	-
Springfield	1	-
Taunton	8	-
Wareham	1	-
Whitman	6	-

516 cases of *tuberculosis hilum*:

Adams	3	-
Amesbury	4	-
Arlington	1	-
Ashburnham	1	-
Attleboro	3	-
Auburn	1	-
Barre	9	-
Bedford	1	-
Belmont	1	-
Beverly	3	-
Boston	66	-
Brockton	6	-
Cambridge	19	-

¹ Died in Milford Hospital.

	Cases.	Deaths.		Cases.	Deaths.
Chelsea	6	-	Fall River	-	1
Chicopee	4	-	Fitchburg	1	-
Everett	4	-	Gloucester	1	-
Fall River	214	-	Greenfield	1	1
Fitchburg	17	-	Haverhill	1	1
Framingham	2	-	Lawrence	2	1
Gardner	3	-	Lynn	-	1
Holyoke	2	-	Malden	1	-
Hudson	7	-	Natick	-	1
Lawrence	2	-	New Bedford	1	2
Leominster	1	-	North Adams	1	1
Lowell	2	-	Quincy	1	1
Ludlow	2	-	Randolph	2	-
Lunenburg	2	-	Springfield	1	1
Lynn	8	-	Taunton	2	2
Malden	9	-	Waltham	-	1
Marblehead	4	-	Worcester	2	2
Marlborough	23	-			
Medford	3	-	74 cases of <i>trachoma</i> :		
Melrose	2	-	Andover	1	-
Milford	6	-	Avon	1	-
Millis	2	-	Boston	41	-
Millville	3	-	Cambridge	6	-
Milton	1	-	Chelsea	2	-
New Bedford	7	-	Everett	1	-
Newburyport	2	-	Gardner	2	-
North Adams	3	-	Hanson	2	-
Norwood	1	-	Hudson	1	-
Peabody	1	-	Lawrence	1	-
Randolph	1	-	Lowell	3	-
Revere	7	-	Lynn	3	-
Shrewsbury	1	-	Malden	2	-
Somerville	6	-	Methuen	1	-
Southborough	1	-	New Bedford	2	-
Springfield	7	-	Quincy	1	-
Stoneham	4	-	Salem	1	-
Swampscott	5	-	Somerville	1	-
Wakefield	3	-	Wakefield	1	-
Waltham	3	-	Worcester	1	-
Webster	1	-			
Wellesley	5	-	16 cases of <i>trichinosis</i> :		
Westport	1	-	Arlington	5	-
Worcester	8	-	Attleboro	2	-
Wrentham	2	-	Boston	1	-
23 cases of <i>tetanus</i> with 19 deaths:			Brockton	1	-
Attleboro	1	-	Fall River	2	-
Boston	2	1	Foxborough	1	-
Concord	1	1	Lynn	1	-
Chicopee	1	1	Pittsfield	1	-
Dartmouth	1	-	Winchester	2	-

REPORT OF DIVISION OF BIOLOGIC LABORATORIES.

BENJAMIN WHITE, PH.D., *Director.*

ELLIOTT S. ROBINSON, M.D., PH.D., *Assistant Director.*

I. ANTITOXIN AND VACCINE LABORATORY.

The annual reports of the last two years have stressed the importance to the work of the laboratory of the additions to the buildings. The past year has been marked by an increase in the activities of all departments of the laboratory and also in the products distributed. The increased activity has been the result of improved organization in the institution and filling of new positions and the greater general efficiency of the personnel.

1. Distribution of Products.

The following table shows the amounts of the various products distributed each year for the past five years:

	1925.	1926.	1927.	1928.	1929.
Diphtheria Antitoxin, 1,000 unit doses	370,412	296,591	346,212	321,202	313,736
Antimeningococcic Serum, 15 c.c. doses	3,262	2,451	2,837	3,643	4,521
Antipneumococcic Serum, 100 c.c. doses	256	247	185	173	96
Antipneumococcic Serum, Conc. 15 c.c. doses	—	—	—	19	740
Antipneumococcic Serum, bulk c.c.	278,600	215,750	213,490	51,800	—
Smallpox Vaccine Virus, capillary tubes	273,153	298,834	294,983	320,091	434,621
Typhoid-Paratyphoid Vaccine, 1 c.c. doses	90,776	88,842	108,387	104,215	84,205
Schick Outfits, 50 doses each	5,403	5,031	5,492	5,747	6,419
Diphtheria Toxin (bulk) c.c.	515	350	630	430	485
Diphtheria Toxin-Antitoxin Mixture, 1 c.c. doses	171,405	205,589	332,463	356,739	354,845
Scarlet Fever Streptococcus Antitoxin, doses	319	3,712	6,114	5,569	4,978
Normal Serum, c.c.	20,290	9,865	23,585	118,150	675,715
Silver Nitrate Solution (ampoules)	—	—	12,148	69,663	61,736
Anti-Measles-Diplococcus Serum, bottles	—	—	104	114	99
Influenza Serum, bottles	—	—	26	10	32

(a) *Diphtheria Antitoxin.* — The amount of this product distributed is slightly less than in the previous two years. It is probable that the distribution of diphtheria antitoxin will follow rather closely the number of cases reported and will decrease as diphtheria becomes less prevalent.

(b) *Antimeningococcic Serum.* — The number of vials of antimeningococcic serum distributed shows a marked increase over any of the last five years. This is undoubtedly due to the larger number of cases of meningitis reported. The reserve stock on hand has also been increased in anticipation of a possible epidemic.

(c) *Antipneumococcic Serum.* — The distribution of this product in 100 c.c. bottles was discontinued in August, 1929, owing to the small demand for it and to the fact that the concentrated serum prepared according to Dr. Felton's method is now available for use in selected cases.

(d) *Smallpox Vaccine Virus.* — The distribution of this product shows a 50 per cent increase over last year's record total. The great demand was due to the epidemic in Gardner and also to the larger epidemic in Middleborough. This unexpected drain was met without undue difficulty. Each year special effort has been made to augment our reserve supply of vaccine virus so that plenty of material was on hand. Filling of the large orders was handled expeditiously and for this work great credit is due to the workers in the vaccine department. Their loyalty and industry deserve special commendation.

(e) *Typhoid-Paratyphoid Vaccine.* — The decreased distribution of this product as compared to the last few years is probably referable to the absence of floods in Massachusetts and elsewhere during the past year.

(f) *Schick Outfits.* — More outfits for the Schick test have been distributed than in the last four years due certainly in part to the effort to have the effectiveness of the diphtheria prevention campaigns controlled by Schick tests following the administration of toxin-antitoxin.

(g) *Diphtheria Toxin-Antitoxin Mixture.* — Approximately the same number of doses of toxin-antitoxin mixture have been distributed this year as last, making the 1929 distribution the second largest. The demand during the Fall of 1929 was larger than ever before.

(h) *Scarlet Fever Streptococcus Antitoxin*.—The distribution of this product has been somewhat less during the past year and the reports on its use continue to be favorable. It is now made under license from the Scarlet Fever Committee. In connection with this product the opinion expressed last year that in general there are more disadvantages than advantages attending the prophylactic use of scarlet fever antitoxin is worth emphasis because in some cases it is followed by serum sickness of more than average severity.

(i) *Normal Serum*.—This includes both serum and plasma. During the past year large amounts of plasma have been used in connection with certain blood protein studies which it is hoped may lead eventually to improved concentration processes.

(j) *Silver Nitrate Solution*.—The demand for silver nitrate ampoules continues approximately constant.

(k) and (l) *Anti-Measles-Diplococcus Serum and Influenza Serum*.—These products are still only in the experimental stage and their general use is not yet advocated.

2. Expenses.

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1925 . . .	\$43,200 00	\$42,507 56	\$34,648 52	\$33,342 18	\$77,848 52	\$75,849 74
1926 . . .	46,000 00	45,025 29	31,184 94	30,747 71	77,184 94	75,773 00
1927 . . .	50,355 00	50,261 54	34,611 11	34,579 87	84,966 11	84,841 41
1927 ¹ . . .			29,500 00	29,488 68	29,500 00	29,488 68
1928 . . .	59,000 00	58,919 09	38,005 37	37,955 34	97,005 37	96,874 22
1929 . . .	63,400 00	63,392 26	39,560 48	39,261 97	102,960 48	102,654 23

¹ Special appropriation for purchase and installation of equipment.

The statement of expenses shows that while salaries have increased, the amount spent for expenses has been kept comparatively low. It is the continuing policy of the laboratory to exercise every economy in the purchase and use of supplies in the hope that any savings made could be applied in the form of appropriations on the salary account. It has been a great gratification to receive such hearty and generous support to our requests for increased appropriations for salaries. The salaries for the non-professional members of the staff—that is for all employees of a grade lower than Junior Bacteriologist—are now satisfactory, but the members of the professional staff are still poorly paid and it is earnestly hoped that a modification will be made in the present salary ranges and that they will be materially increased. It is desired to place the higher professional positions on a salary basis at least comparable to other similar departments both in the federal and other state service and in university service.

3. Improvements.

(a) Studies on the concentration of antitoxins have been continued and the application of the results already obtained has resulted in improvement both in the appearance and stability of these products.

(b) The concentration of and refining of antipneumococcic serum which was started in the previous fiscal year has been continued and the product now made has given satisfactory results in the comparatively small number of cases in which it has been used. At present the antibody solution is active against Type I and Type II pneumococci. The use of serum against the other types has not yet been shown to be of value.

(c) The appropriations for expenses have made it possible to purchase further equipment both for the laboratory and the stable which have resulted in the saving of still larger expenditures which would have been necessary if it were not for this added equipment.

4. Reorganization.

A careful study of the organization of the laboratory has resulted in a re-allocation of duties and a further separation of these duties into more distinct departments, thereby doing away with some confusion in the work and increasing the efficiency of the staff.

5. *Personnel.*

The important changes in the personnel this year have been in the bacteriological department. Dr. Kenneth Goodner was appointed as a Senior Bacteriologist — a new position — and placed in charge of the bacteriological group. Miss Elizabeth McDougall has taken the position of Junior Bacteriologist, formerly held by Miss Coulson, while Miss Hale, who has been a member of the staff as an Assistant Bacteriologist since 1921 and who in that time has rendered a notable service, retired at the end of the fiscal year and has been replaced by Miss Elizabeth Jost. The new positions added were those of Senior Bacteriologist and one Laboratory Helper so that the personnel at present is made up as follows: 1 Director, 1 Assistant Director, 3 Senior Bacteriologists, 1 Assistant Bacteriologist, 1 Junior Bacteriologist, 1 Senior Chemist, 1 Assistant Chemist, 1 Principal Clerk and Stenographer, 1 Junior Clerk and Stenographer, 1 Senior Clerk, 3 Laboratory Assistants, 10 Laboratory Helpers, 13 Laborers, 2 Janitors, 1 Stable Foreman — 41 in all.

6. *Reclassification.*

The opinion expressed last year about the new classification of personnel still holds. Thanks to the favorable action of the Commission on Administration and Finance, a new grade was added recently — that of Supervising Laboratory Technician — which fills in an important gap between the grades of Laboratory Assistant and Junior Bacteriologist. While the other grades established fit the organization most satisfactorily, an increase in the salary ranges for the higher grades, as already mentioned is most desirable.

7. *Educational Activities.*

In addition to the regular course in Applied Immunology given in connection with the Harvard School of Public Health, 31 demonstrations have been given to classes of medical students, nurses, teachers and school students. Large classes from the three medical schools of Boston, as well as nurses from Simmons College, the Massachusetts General, Waltham, Quincy, Melrose, Peter Bent Brigham, Lowell General, Massachusetts Homeopathic, Newton, Goddard, McLean, Lawrence General, Leonard Morse and Brockton Hospitals and the N. E. Sanitarium and Hospital have been shown the various processes required in the making of biologic products. The cooperation of this laboratory with Simmons College in the training of laboratory technicians has also been continued and during the year six students have completed the course. This course has become so popular that the number of students is now limited by requiring a college degree for admission. Three students from foreign countries have spent varying lengths of time studying laboratory administration and the methods of preparing and testing serums and vaccines.

8. *Lectures and Addresses.*

The Director and the Assistant Director have as usual participated in the course of Immunology at the Harvard Medical School and in the Public Health courses at the Massachusetts Institute of Technology and the Tufts Medical School. They have also given addresses before meetings of medical societies and other organizations. Scientists and public health workers from Austria, England, France, Holland, Italy, Japan, Mexico, Nicaragua, Ontario and Turkey and from fourteen states have visited the laboratory.

9. *Investigations.*

(a) A bacteriological study of the Lee epidemic and septic sore throat has been completed and the results have been published.

(b) During the past year cultures from two other small epidemics have been studied and experiments carried out to show the invasiveness of hemolytic streptococci of human origin in the milk ducts of a healthy cow.

(c) The study of the inheritance of resistance in the rat to paratyphoid infection has been concluded. This work was done in conjunction with the Bussey Institution for Applied Biology of Harvard University and the student performing

it has now left to take a position at the Rockefeller Institute in New York, where his study will be continued.

(d) A continuing study is being made of the concentration of antipneumococcic serum according to the method of Felton. The product that is now being distributed has been supplied to a number of hospitals and according to the reports received it has given satisfactory results in the comparatively small number of cases that it has been used. At present this concentrated serum is active against Type I and Type II pneumococci and so far it has been possible to make a product which apparently is free from the substance which causes immediate reactions. It is intended to continue not only a laboratory study of this product with a view to improving its potency and quality, but also with the cooperation of the various hospitals to study its therapeutic action. If the results continue to be as favorable as they are in lobar pneumonia due to Type I and II pneumococcus, this product will then be released for general distribution. This serum is not indicated in cases of pneumonia due to pneumococci other than Types I and II.

(e) The adaptation of Felton's method to the concentration of antimeningococcic serum has been attempted and a concentrated product satisfactory from a laboratory standpoint has been obtained and is being put to clinical trial. Other methods for the concentration of this serum and the antipneumococcic serum have been developed and products have been obtained which show a satisfactory increase in the antibody content along with a decrease in viscosity. These products will shortly be given therapeutic trial.

(f) A problem of great theoretical and practical interest has to do with the chemical nature of antibodies. Much of our knowledge is founded upon older methods of separation and our methods for the separation and concentration of antibodies have failed to keep up with advances in our chemical knowledge. The magnitude of this task has been so great as to exceed the facilities of the laboratory. It is, therefore, most fortunate that the interest of such an able chemist as Dr. Edwin Cohn of the Harvard Medical School has been enlisted. Dr. Cohn is now making a chemical study of the various constituents of horse serum and for this work this laboratory has supplied a considerable amount of normal horse serum and plasma. When this fundamental work is finished, Dr. Cohn expects to continue his studies on the serum and plasma of horses under immunization.

10. Publications.

- White, Benjamin: Epidemic Septic Sore Throat. I. Historical Review. New England Journal of Medicine, Vol. 200, No. 16, p. 797, April 18, 1929.
- Bigelow, George H., and White, Benjamin: III. Review of the 1928 Epidemic in Massachusetts. New England Journal of Medicine, Vol. 200, No. 16, p. 807, April 18, 1929.
- Robinson, Elliott S., and Beckler, Edith: Bacteriological Study of Hemolytic Streptococci from a Massachusetts Outbreak of Septic Sore Throat in 1928. Journal of Preventive Medicine, Vol. 3, No. 3, p. 225, May, 1929.
- Bunney, W. E., and White, Benjamin: The Buffered Diluent for Schick Toxin. Proc. Soc. for Experimental Biology and Medicine, Vol. XXVI, p. 801, 1929.
- White, Benjamin: Serums and Vaccines in the Prevention and Treatment of Disease. Annals Internal Medicine, Vol. III, No. 4, p. 309, Oct., 1929.

11. Inspection.

Dr. George W. McCoy, Director of the Hygienic Laboratory of the United States Public Health Service made his usual annual inspection of this laboratory in September. The United States Treasury Department license to manufacture and sell biologic products was continued.

II. WASSERMANN LABORATORY.

WILLIAM A. HINTON, M.D., *Chief of Laboratory.*

1. Tests and Examinations.

	1925.	1926.	1927.	1928.	1929.
Wassermann Tests	62,695	64,665	67,700	75,471	81,156
Kahn Tests	2,729	1,302	2,644	2,692	3,631
Gonococcus Fixation Tests	1,903	1,776	1,409	1,860	2,463
Lange's Colloidal Gold Tests	33	25	35	27	85
Complement Fixation Tests for Glanders	50	27	15	37	16
Specimens of Milk Examined for Tuberculosis	-	-	46	21	-
Complement Fixation tests for Antimeningococcic Serum	-	79	-	-	-
Diagnostic Examinations for the Division of Animal Industry:					
(a) Complement Fixation Tests for Glanders	42	43	33	44	91
(b) Examinations for Rabies	282	312	510	546	455
(c) Pathologic and Bacteriologic Examinations	24	18	21	24	23
(d) Agglutination Tests for Bacillus abortus	89	101	282	822	3,911
Diagnostic Examinations for Lakeville State Sanatorium	-	-	-	5	-
	67,847	68,348	72,695	81,549	91,831

The total number of tests done shows an increase of over 10 per cent over the totals for 1928. The greatest increases are in the case of Wassermann tests and the agglutination tests for Bacillus abortus. In addition Kahn tests have been done on many of the specimens submitted for the Wassermann test. The number of rabies examinations is smaller than for the past two years. The agglutination tests for Bacillus abortus have increased nearly five-fold due, of course, to the increased interest in undulant fever. The total number of tests performed of all kinds is approximately 10,300 more than in the previous year and the unit cost per test has been reduced from 24.2 cents in 1927 and 23 cents in 1928 to 22.4 cents in 1929. This gratifying reduction in the unit cost per test has been due to the greater interest on the part of the members of the staff and their greater efficiency. The increase in salaries which has been generously granted each year has proved to be a sound investment.

2. Expenses.

YEAR.	PERSONAL SERVICES.		EXPENSES.		TOTAL.	
	Appropriation.	Spent.	Appropriation.	Spent.	Appropriation.	Spent.
1925	\$12,500 00	\$11,984 70	\$6,000 00	\$5,971 18	\$18,500 00	\$17,955 88
1926	12,600 00	12,186 98	5,500 00	5,386 40	18,100 00	17,573 38
1927	12,616 00	12,506 91	5,300 00	5,068 66	17,196 00	17,575 57
1928	14,000 00	13,723 34	5,182 25	5,094 01	19,182 25	18,817 35
1929	15,800 00	15,328 93	5,300 00	5,297 13	21,100 00	20,626 06

It may be permissible to point out that in spite of the continued increase in the work of the laboratory, the actual amount spent for expenses is over 10 per cent less than the amount spent in 1925. Here again is proof of the soundness of the policy of paying scientific and technical workers adequate salaries, because with such an incentive far greater attention is given to the economies of operation.

3. Investigations.

Work on the Hinton glycerol-cholesterol agglutination reaction mentioned in last year's report has been continued. Although it appears to be distinctly superior to the Wasserman and Kahn tests, it is still too soon to recommend its substitution for the latter two tests. In addition, work has been done on a serum reaction to aid in the diagnosis of tuberculosis, on which a preliminary note is about ready for publication.

4. Teaching.

As in previous years this laboratory has been used for teaching purposes, both in the Harvard Medical School and the School of Public Health, and it has also received students from Simmons College for training in serology.

REPORT OF DIVISION OF CHILD HYGIENE.

M. LUISE DIEZ, M.D., *Director*.

I hereby submit the annual report of the Division of Child Hygiene for the fiscal year ending November 30, 1929. May I take this opportunity to express my appreciation of my appointment as Director of this Division, and the pleasure it is to work in the Department.

I believe progress has been made during the year. There were a few new projects and the routine activities were emphasized and strengthened considerably. Division activities will be discussed in the following order.

- I. Personnel of the Division.
- II. Appropriation for the Fiscal Year 1928-1929.

III. Activities of the Various Sections:

1. *Maternal, Infant and Preschool Hygiene:*

- (a) Maternity Service.
- (b) Well Child Conferences.
- (c) Summer Round-Up.

2. *School Hygiene:*

- (a) Legislation.
- (b) Surveys.
- (c) School Hygiene Conferences.
- (d) Normal School Project.
- (e) Courses at Sargent School.
- (f) Lynn Demonstration.
- (g) Hyannis Normal School Courses.
- (h) Fitchburg Courses, Normal School.
- (i) Handbook of School Hygiene.

3. *Public Health Nursing:*

- (a) Duties of Nursing Consultants.
- (b) Local Organizations.
- (c) Lecture Courses.
- (d) Addition to Staff.

4. *Nutrition:*

- (a) Duties of Nutritionists.
- (b) Chadwick Clinics.
- (c) Follow-up Clinics.
- (d) School Lunches.
- (e) Nutrition Courses.
- (f) Local Demonstrations.
- (g) Summer Camps.

5. *Dental Hygiene:*

- (a) Report of Progress.
- (b) Hyannis Course.
- (c) Preventive Program.

6. *Health Education and Publicity:*

- (a) Pamphlets, posters, exhibits, etc.
- (b) Art Correlation.
- (c) Publicity.
- (d) Lectures.
- (e) Prenatal and Postnatal Letters.

IV. Special Projects of the Division:

- 1. May Day-Child Health Day, and Summer Round-Up.
- 2. Department Library.

V. Recommendations:

- 1. Prenatal Service.
- 2. Well Child Conferences.
- 3. Child Health Day.
- 4. Public Health Nursing.

V. Recommendations — *Concluded.*

5. School Hygiene.
6. Dental Hygiene.
7. Nutrition.
8. Health Education.

I. PERSONNEL OF THE DIVISION.

There have been added to the staff of the Division during the past year a Public Health Nutrition Worker, Miss Dorothea Nicoll, and a Department Consultant in Public Health Nursing, Miss Mary P. Billmeyer. The office staff has been increased by the addition of another junior clerk and stenographer and an additional junior messenger.

Owing to the stress of special work for particular projects such as May Day-Child Health Day, and the Summer Round-Up, it was necessary to employ the following temporary workers at various times during the year: 11 junior clerks and stenographers; 7 junior messengers; 5 nutrition workers; 2 conference physicians; 1 public health nurse; 1 public health nursing supervisor; 2 laborers.

II. APPROPRIATIONS FOR THE FISCAL YEAR 1928-1929.

Division of Hygiene.

	Services.	Expenses.
Appropriation	\$33,000 00	\$16,600 00
1928, brought forward	—	25 55
Credits	—	73 97
		<hr/>
Expended to date	32,449 48	\$16,699 52
	<hr/>	16,697 48
	\$550 52	<hr/>
		\$2 04

Maternal and Child Hygiene.

Appropriation	\$21,000 00	\$10,900 00
Credits	—	8 31
		<hr/>
Expended to date	20,524 42	\$10,908 31
	<hr/>	10,904 41
	\$475 58	<hr/>
		\$3 90

III. ACTIVITIES OF THE VARIOUS SECTIONS.

Beginning July 1st, upon the creation of the New Division of Adult Hygiene in the Department, the name of the Division of Hygiene was changed to that of Division of Child Hygiene. At that time it was decided that the Division of Child Hygiene include the age groups from infancy through the teacher-training period, approximately eighteen years, and the Division of Adult Hygiene include from that age group on through adult life.

1. Maternal, Infant and Preschool Hygiene.

(a) *Maternity Service.*

No new maternity program has been outlined. As in previous years, the prenatal letters are being sent out upon request to prospective mothers, and the postnatal letters are sent to mothers of children under two years of age. These requests come from hospitals taking maternity cases, from visiting nursing associations, from physicians, women attending the well child conferences, through department stores in their infant sections, from patients themselves or through their friends. As planned last year, we continue to send the Father's Letter to all families requesting the prenatal letters. A summary of the numbers reached in this way will appear later in the report. More hospitals are becoming interested in seeing that the patients registering with them receive this service. Through

the letter service also we have much correspondence directly from the mothers bringing their problems to us for solution.

Through the stimulation of our Nursing Consultants the communities are becoming more interested in maternity service in general. During the year the Consultant Nurses have compiled lists giving the names of physicians in the various districts who are practising obstetrics. They also secured lists of communities giving delivery service and a file of well child conferences carrying on prenatal work in connection with the conference. We believe that this information will prove of value when we launch our maternity program.

(b) Well Child Conferences.

We are still carrying on the program of demonstration well child conferences to communities, upon request. Formerly it was the policy to demonstrate but once to any community. We believe in many cases this is not sufficient, so are offering the service to communities which have had previous demonstration conferences if they so desire.

We are also offering to communities conducting weighing and measuring conferences, without medical service, a demonstration of medical service through our well child conference unit.

In the past year our well child conference unit conducted 54 well child conferences, 31 of which were held in Franklin County. At the 31 Franklin County Conferences there were examined 1,505 children and at the remaining 23 conferences, 700 children, making a total of 2,205 examinations.

In connection with several of the demonstration well child conferences there was also a demonstration in dental hygiene by the Consultant in Dental Hygiene of the Department.

In communities where no physician was available locally, we offered the services of a physician for the purpose of carrying on the Summer Round-Up.

We are continuing the well child conference demonstration in Franklin County for a period of five years, believing that it would be essential in order to have sufficient numbers of children repeating the examination to have a comprehensive evaluation. Also, it was thought wise to have more publicity concerning the demonstration to stimulate a wider interest among the people in the county; therefore, in the spring a meeting was held of the health workers in the county with members of our staff. The Public Health Education Worker was sent into the county to organize previous to holding the third series of consultations. As a result interest on the part of the nurses has been stimulated and we have had very good community cooperation. It is interesting to note that the first conference of health workers in Franklin County led to other conferences and study groups and it is our hope that this organization will become a permanent one. A new feature this year was the report of physical defects and recommendations sent to the mother, as well as to the nurse in the town, resulting in better cooperation on the part of the parents.

During the three years' demonstration there have been 5,194 examinations made of 3,479 children. Based upon the third examination 34% have attended the conference twice, and 23% have attended three times. There is much difficulty encountered on the part of the local organization to have the parents realize the necessity for repeated examination, their belief being that one examination is sufficient and therefore are loath to bring their children back the following year.

As a result of a study of the three years' demonstration it is noted that the total number of defects is decreasing and the total number of corrections increasing. The defects most often encountered are teeth, throat, nutrition and skin. In 1927, 2% corrections were reported; in 1928, 10%, and in 1929, 16% were reported.

(c) Summer Round-Up.

Again this year we have cooperated with the National Congress of Parents and Teachers in their project, the Summer Round-Up, and we have a successful year to report. Early in the year, through the concentrated efforts of the Department of Education, through the Assistant Supervisor of Physical Education, and members of our own staff, communities were reached to interest them in the

Summer Round-Up project. Various agencies cooperated in the communities — the superintendent of schools, visiting nursing associations, Child Health Committees, Parent-Teacher Associations, Boards of Health, our own well child conference unit in Franklin County, and combinations of the above. In 1927 there were 39 communities cooperating; in 1928, 79; and in 1929, 192. Approximately 54% of the towns in the Commonwealth have had Summer Round-Up this year. In 1928 there were about 3,000 children who received an examination through the Summer Round-Up, and in 1929, 12,864 were examined out of a possible 67,677 estimated as entering school for the first time — an increase of about 10,000 over the previous year. Consequently, approximately 19% of the entering class this year had a previous health examination. It is interesting to note that of the number examined 1,269 were reported as being examined by their family physician. The number of children found to have defects was 5,765, approximately 63% of those examined.

We have had good cooperation on the part of newspapers in giving publicity to this project. In 1927 there were 12 newspapers reporting this activity; in 1928, 56; and in 1929, 76.

We regret that the report of correction of defects is not complete and cannot be included in this report.

2. School Hygiene.

(a) Legislation.

There has been no change in any of the laws pertaining to school medical service. An attempt was made to introduce a bill raising the standards for dental hygienists employed in the schools but this was referred to the next annual session of the legislature. Therefore, another bill will be submitted this year covering such employment.

Great difficulty is encountered in interpretation of the laws governing the employment of school dentists and dental hygienists in the local communities. It is our feeling that the State Department of Education is not favorable to establishing standards by legislation but rather gain this end through an informed public.

(b) Surveys.

We are still offering to superintendents of schools the survey service carried on by the Pediatrician and the Nursing Consultants of the Division, and we hope to be able to cooperate in this with the city surveys carried on through the Division of Communicable Diseases.

The school hygiene surveys carried on during the past year were Lexington, Southwick, Rockport and Marlborough, and a short study was made of school health conditions in Amherst. In practically every community where the survey has been made they have cooperated and changed conditions for the better.

The Nursing Consultants of the Division have continued to make contacts with the school nurses in local communities and will continue to offer assistance as required.

(c) School Hygiene Conferences.

The usual school hygiene conferences were planned for the autumn, but only one of the series was held during the fiscal year 1929, the other three being held early in December. The Department of Education felt that two meetings were unnecessary for the western part of the state; therefore, but one meeting was held, in Springfield. The subjects covered this year in these conferences were as follows:

Plans for May Day-Child Health Day.

The Teaching and Living of Health.

Building an Outline for Health Teaching.

The Administration of School Medical and Nursing Service.

The Value of Summer Round-Up to the School Health Program.

Nutrition and the Dental Program.

Health as a Fundamental Factor in Education.

Standards for School Medical Work.

Round table conferences were held for superintendents of schools and school physicians, and for nurses and school dental workers. These added to the interest and value of the conference.

At the Springfield conference there was an attendance of 107 persons, representing all groups interested in the health of the child of school age.

These conferences brought out the fact that it is difficult to get the school physicians together for discussion, and without their interest and cooperation it will be difficult to make very definite changes in the school medical service in raising standards.

(d) Normal School Project.

The services of the Pediatrician are still loaned to the Salem Normal School and a very splendid piece of health education work is being carried on as a result. Each student on entrance is given a complete examination which includes Von Pirquet test, X-Ray examination of every positive reactor, audiometer test of every freshman, and every freshman found having defects receives a check-up during the year, being referred to physicians for correction and to specialists where considered necessary.

Through this service a conference was held with the Principals of the Normal Schools to discuss standards for health service, and a physical record card was compiled for use in all the normal schools.

(e) Courses at Sargent School.

Courses in personal hygiene are given by the Pediatrician for the freshmen at the Sargent School of Physical Education, which is now a part of the Boston University School of Education. Courses on Social Hygiene are given to the senior classes of the same school. We are hoping through this contact that physical education will receive its proper emphasis in the school health program.

(f) Lynn Demonstration.

We are cooperating with the Massachusetts Tuberculosis League in a demonstration being carried on in the Lynn high schools. The purpose of the demonstration is to discover what should be added to the curriculum of the high school in the way of health education based on the knowledge and health conditions of the pupils. After numerous conferences it was decided that the English High School, a vocational school, should be selected for the experimental group, and the Classical High School, for the control group. Health knowledge tests were given to these pupils in September and these are now being evaluated. Health habit histories were taken of all these children and a record card made upon which there is some social history; data concerning employment, place of employment, hours employed, the necessity for employment, and the hours of home work; content of the school lunch, time for eating, place where eaten, for a nutrition study in relation to this; and habit history regarding the usual standard habits. There is also included a history of the social, recreational and physical activities of the pupil; a place on the card for a summary of physical defects and recommendations; score of the health knowledge test, the intelligence quotient and the educational quotient of every pupil. From the two high schools 800 students, boys and girls, were selected and were given a physical examination, two physicians from the Department examining them. The posture and feet were tested by the physical education group, the weighing and measuring and eye tests given by the teachers, and hearing tests made by the audiometer. Chest X-Rays were made on 520 of the group.

A complete study will be made of this data and upon this will be built the school curriculum.

(g) Hyannis Normal School Courses.

Courses to teachers and school nurses were given again this year at Hyannis Normal School by a Pediatrician, a Nursing Consultant, the Consultant in Nutrition and the Dental Hygiene Consultant of the Department; a former School Nursing Consultant of the Department was secured to give the course in School Nursing Procedures. Of those attending, 43 were teachers and 27 nurses, 7 of

the latter from outside the state. Taking the course in social service were 14 nurses, 2 from outside the state; 15 dental hygienists took the course in dental hygiene, 5 being from outside the state; 7 nurses and 2 dental hygienists took the course in nutrition. Certificates were given to 2 nurses and 2 dental hygienists. There was some change in the courses offered this year and in the time allotted for lectures.

This seems a very worth while project and we hope that it may be enlarged and continued.

(h) Courses in Nutrition at Fitchburg Normal School.

At the Fitchburg Normal School courses in nutrition were offered to the teachers in Day Vocational Schools and Evening Practical Arts classes. There were 12 teachers who took the one-week course and 14 teachers taking the two-week course.

(i) Handbook of School Hygiene.

The Handbook of School Hygiene has been brought almost to completion and will be published, we hope, in the early part of the coming year.

3. Public Health Nursing.

(a) Duties of the Nursing Consultants.

The duties of the Public Health Nursing Consultants are the same as in former years, except for a slight change in policy regarding time in the field. Heretofore the nurses have been required to be in the office all day Monday and Saturday mornings, for office conferences and clerical work. Believing that work in the field is more valuable, this ruling has been abolished, thus allowing the nurses at least another full day in the field, with the privilege of office appointments and sufficient time for clerical help.

The nurses' reports show the results of a busy, active year in the field in their contacts in local communities.

(b) Local Organizations.

One of the outstanding projects has been the organization of groups of health workers similar to the Northern Worcester County Public Health Association established the previous year. In the Worcester County district there has been formed the Blackstone Valley Public Health Workers Association. In the South-eastern District there was formed the South Shore Health Workers Club and the Cape Cod Health Workers Association. This gives us an opportunity to present our program to the local workers in group meetings which saves the time and energy of the consultant nurses; also, we are hoping through these groups that we may put on our further education in public health nursing.

Mother Study Groups are being organized by which the lay groups can be reached directly for instruction. One such group was formed in Oxford the past year.

The nursing consultants have stimulated communities in the adoption of records. It is rather appalling to realize how comparatively few communities in the state are using records by which the work done by public health nurses can be evaluated.

The nurses are also stimulating maternity nursing in the various communities.

Much has been done to try to raise standards in every field of their activity. They still act in an advisory capacity to local nurses. We would prefer, however, that a little more emphasis be added as, to our way of thinking, this is a negative approach and the local community therefore is not sufficiently stimulated to raise standards. In order to add emphasis we are asking that the nurses spend more time in the community in giving actual assistance to the nurses in formulating programs, establishing records and organizing the community to give the necessary cooperation.

(c) Lecture Courses.

The consultant nurses are giving courses on public health and public health nursing in various nurse training schools. The requests for this type of service are increasing and we believe that this is a valuable project.

Several of the groups of health workers are having their meeting place in hospitals in order that the senior class of the training school may have the advantage of hearing the speakers on public health subjects. Through these lectures a number of private duty nurses are taking the post-graduate course at Simmons College and will go back to their communities better trained for community nursing.

It is through the efforts of the consultant nurses that the Summer Round-Up proved so successful. We commend them for the interest they have shown in the program of the Division and the enthusiastic cooperation they have given to the Director.

(d) Addition to the Staff.

To the nursing staff has been added a Department Consultant in Public Health Nursing. It is difficult to outline her duties in full as yet but it is our desire to have her assist in coordinating the work of the public health nurses and social workers of the staff of the Department, to give assistance to Directors in outlining programs for field workers, to assist in all the projects of the various divisions of the Department, to give the courses in school nursing procedures and social service for nurses at Hyannis Normal School, to give assistance in the field where desired through the various agencies, and to act as Consultant in Public Health Nursing for the various agencies.

To give assistance in formulating a program an Advisory Committee has been formed called the Advisory Committee on Public Health Nursing and Social Service. The members of this Committee are the following: Miss Ida M. Cannon, Miss Katherine McMahon, Miss Florence Patterson, Miss Gertrude Peabody, Miss Marion Rice, and Dr. W. G. Smillie.

4. Nutrition.

(a) Duties of the Nutritionists.

Through the change made in the conduct of the Ten-Year Program and a community demonstration in nutrition that is being carried on, we have had to add another nutritionist to our personnel.

At present we have one full-time nutrition worker assigned to the well child conferences as part of our unit. When the unit is not holding conferences her services are offered to demonstrate the value of nutrition instruction at the well child conferences in communities which are conducting such conferences without a physician in attendance. A number of communities have availed themselves of this service and as a consequence have appointed nutrition workers.

A full-time nutrition worker is making home visits on the cases examined in the Chadwick Clinics. Two full-time nutrition workers are assigned to the two follow-up clinics in the Ten-Year Program, and a full-time nutrition worker to the nutrition demonstration being conducted in Natick and Wellesley. The Nutrition Consultant supervises all these activities. The work of the nutritionists is well coordinated and if necessary they must, and do, fit into any part of the program.

(b) Chadwick Clinics.

The undernourished children, of which there seems to be a large number who are not reactors, are noted by the physician on the Chadwick Clinic when they are examined for the result of the Von Pirquet test. The names of these children are submitted to this Division and a community program is being drawn up by the Nutrition Consultant to care for these children. The positive and contact cases are visited in the homes. Our nutrition work is receiving good cooperation on the part of the parents and this seems to be a satisfactory method of contact.

(c) Follow-Up Clinics.

Two full-time nutrition workers are assigned to this service. In addition to the work done in the clinic they are having an opportunity to visit the local school lunches which is of value for better discussion with the child of the type of lunch

he may select. In the report of the follow-up clinic the per cent of malnourished children given for 1927-1928 was 52%, while that for 1928-1929 was 25%.

(d) *School Lunches.*

A special study was made of the school lunches served in the various schools throughout the State. This was done by the Nutrition Consultant in her visits to the various cities and towns, and recommendations were made for bettering such service where necessary. During the year 24 such school lunches were reported upon.

(e) *Nutrition Courses.*

As previously mentioned, courses in nutrition for nurses and dental hygienists were given at Hyannis Normal School during the summer, and for teachers at Fitchburg Normal School.

(f) *Local Demonstrations.*

The town of Natick made a definite request for help in formulating a nutrition program, affording to surrounding towns the privilege of coming in on such a demonstration. Wellesley has consented to do so. The children were selected for this demonstration through the schools as a result of the physical examination given by the school physician, and were limited to those marked "poor nutrition." Visits were made to the homes of such children to interest the mother in better food selection and health habits for the child and to gain her cooperation. Group meetings were arranged and health education in the schools was provided by post-graduate students from Wellesley College. They are working very well into the program and the project is thereby stimulated.

Close cooperation exists between the Extension Service of the Massachusetts Agricultural College in relation to our Franklin County Demonstration and the study groups of the 4-H Clubs.

The Consultant in Nutrition has given 74 lectures during the year, has written three articles for publication, and has supervised the entire nutrition program for the Department; has given courses to teachers, nurses and lay groups, three such courses being given for each group; in each course is a series of six lectures during six successive weeks, and numerous requests are being received for such courses. In addition to these she has supervised the dietaries of the institutions under the Department, and has conducted the course in nutrition at Hyannis Normal School, previously mentioned.

(g) *Summer Health Camps.*

As a summer project the Summer Health Camps were visited by one of the nutrition workers and assistance given in dietaries, etc. During the past summer 17 such camps were visited.

A special study was made in relation to the Sunshine Camp, conducted by the Cambridge Tuberculosis Association, to find out whether or not there were enough permanent results gained through summer camps to warrant the expenditure of money required. A complete report of this study will be available later.

5. **Dental Hygiene.**

(a) *Report of Progress.*

There has been no change made in the dental program of the Division during the past year. A report of progress follows:

	1928.	1929.
Communities carrying on dental campaigns	182	228
Dental clinics carried on in the state	177	203
Dental hygienists employed in the state	44	47
School dentists employed in the state	213	250

(b) *Hyannis Course.*

There were 15 dental hygienists in attendance at the course in school dental procedures given at Hyannis Normal School, two of these receiving certificates for completion of the course. The value of this course is demonstrated by the

fact that at least fifteen requests have come to the Department from school superintendents for the names of dental hygienists who have had the course at Hyannis, to fill vacancies in their towns.

(c) *Preventive Program.*

The Dental Hygiene Consultant made surveys of the dental program in 18 communities and has stimulated communities to carry on a preventive rather than reparative program, concentrating the preventive work in the first three grades. The interest in the dental campaign still continues and it is to be hoped that eventually every community will be giving the necessary dental service to the prenatal, pre-school and school age groups. An effort has been made to stimulate the interest not only of the community health workers but the dentists in carrying the preventive program into the prenatal period. The only prenatal dental clinic service in the state is at the Springfield Hospital, Junior League Dental Clinic.

The dental printed material distributed during the year numbered about 1,011,450 pieces, which included the Monthly Bulletin to School Dental Workers.

6. Health Education and Publicity.

(a) *Pamphlets, Posters, Exhibits, etc.*

During the year the printing of our pamphlets totalled 2,793,300 copies, which with the 21,500 copies of The Commonwealth, makes a total of 2,814,800 pieces of literature for distribution. An effort was made to bring the printed material up to date through revision or addition of new leaflets. The leaflets are now being issued in uniform size which assists greatly in storage, mailing and cost of material. New material printed has been "Your Teeth" and "The Brownie Health Rules." Among those revised were "Save Those Baby Teeth", a combination of two leaflets; "Aids to Bowel Movement", another combination of two leaflets; "Keeping Well"; a leaflet entitled "Protect Them Against Diphtheria", to take the place of an old one, though having entirely new content; "Feeding the Pre-school Child" and "Feeding the Adolescent" have also been revised. Work was done also in preparation for printing of three new leaflets entitled "Breast Feeding", "Prenatal Care" and "Care of the Pre-school Child", as well as the leaflet on "Posture" and the "Handbook of School Hygiene".

A number of posters were discarded because of not being suitable material and we have added new posters to our list. Much experimental work has been done during the year on various types of posters, using oilcloth, felt, and the ordinary shade cloth material previously used. Two new posters were designed, one for May Day-Child Health Day, and one for the Summer Round-Up campaign, and distributed to the communities requesting them. A set of posters was made for the pre-school age period, on the subject of health habits. These have been photographed from the original posters, and will be used in the Department well child conferences and distributed to each established well child conference in the State. Another set on health habits, for the high school age group, was completed and will be similarly duplicated. Various maps, charts and graphs were made for the Department staff.

The only exhibit made during the past year was one on dental hygiene, prepared for use at the Annual Convention of the Massachusetts State Dental Society held in Boston. This was an interesting and graphic portrayal of the growth of the dental work in the Commonwealth over a period of years. Much time was spent in planning exhibits to be carried out early in the coming year. We have added to our material, however, a motograph, an electrically driven device through which any message can be put across emphasizing any project of the Department.

Several new moving picture films have been added to our library but most of the films now in our possession are old and need to be replaced. Many films put out by various commercial concerns have been reviewed and found wanting. We are loath to purchase films that are not correct scientifically, or do not have a popular appeal. We have added several films to our delineascope collection, a type of film strip which is becoming more popular as it can be used by anyone.

We are equipped now to photograph our own local activities from which to make delineascope films; therefore, in our opinion, adding to the interest of the local people.

(b) *Art Correlation.*

We are still conducting our health poster project in the schools through the cooperation of the drawing supervisors. This has not been carried on to as great an extent as in previous years because of the increased demand for the services of the artist for poster work, special graphs, etc. In 1929 about 116 communities were visited and 114,050 sheets of health slogans were distributed. A new order blank was devised for the use of teachers, the titles of printed material arranged according to age groups, greatly facilitating the ordering and shipping of material. There were 7,593 of these provided to teachers, and the number of pieces of literature requested by them totalled 619,989 — an increase of about 16% over the previous year.

(c) *Publicity.*

We have received splendid cooperation from the newspapers throughout the entire year. We are making contacts with the local correspondents of the various papers and through them are able to have good publicity given to our various activities.

(d) *Lectures.*

There were 573 lectures given by the various members of the Department, reaching approximately 32,690 persons. In addition to these 34 radio talks were given during the year.

(e) *Prenatal and Postnatal Letters.*

This year we issued prenatal letters to 5,670 prospective mothers, an increase of 674 over the previous year; postnatal letters were sent monthly to 5,121 new mothers, an increase of 155 over the previous year. The letter to fathers was sent to the father in each case of a request for the prenatal service from the mother, the total for the year being 5,670. The prospective mothers on the prenatal registry are carried over automatically to the postnatal letter registry to receive monthly letters on care of the baby during its first two years.

IV. SPECIAL PROJECTS OF THE DIVISION.

1. **May Day — Child Health Day, and the Summer Round-Up.**

Again we cooperated with the American Child Health Association in their May Day-Child Health Day. In our publicity and our organization plans in connection with May Day-Child Health Day we also put across the project of the Summer Round-Up, linking it up very closely with the former activity as a beginning of the school hygiene program.

In 1929 the slogan selected by the American Child Health Association was "Play," hence, the cooperation with the Assistant Director of Physical Education of the State Department of Education. In 1927 there were 159 towns cooperating in this project; in 1928, 233; and in 1929, 261 towns cooperated. In 1927 there were 96 local Child Health Committee Chairmen appointed, with no report of activities. In 1928, there were 141, with 90 reporting. In 1929, there were 138 such chairmen, with 125 reporting activities in the interest of May Day-Child Health Day. To carry out the plans outlined by the Department tags were distributed to the children showing good posture, clean, sound teeth, and to those coming within the normal weight range. The emphasis on the May Day-Child Health Day activity has been put upon the fact that it should not be a one day celebration but should be the culmination of the health activities throughout the year, based upon the school health program.

2. **Department Library.**

In order that the facilities of the Department Library might be better administered a Library Committee was formed, consisting of the Director of the Division of Communicable Diseases, a representative from the Division of Adult Hygiene,

the Director of the Division of Child Hygiene, and the Librarian. An effort has been made to add to the library as much as is possible in the way of books, magazines, etc., with the limited appropriation available. In 1929 there were added 127 new books and pamphlets; 79 subscriptions were renewed, and 5 new subscriptions entered. These are exclusive of a separate library of reference material arranged for use at the Hyannis Normal School courses.

The Librarian assisted in editing *The Commonwealth* and the annual report of the department, catalogued books and pamphlets as far as possible under present conditions, and gave valuable assistance in research work.

The purchase of a silver screen has made possible the showing of films in the library.

V. RECOMMENDATIONS.

1. Prenatal Service.

We hope to launch a definite prenatal program in 1930 under the guidance of the Advisory Committee on Child Hygiene which is in process of formation. As a part of this program we hope to be able to gain the cooperation of the physicians and possibly by a series of institutes or post-graduate lectures, interest them further in the subject of maternity hygiene. There is always the question of research work and the possibility of special studies. Whether or not we are equipped to carry this on or perhaps interest some other agencies is a question to be considered. Personally we believe we must prepare the field generally for such a program, particularly the public health nurses from whom we expect to get cooperation. As much of this work must be done through correspondence there will have to be taken into consideration the appropriation necessary for postage.

We should like to see started more general prenatal nursing conferences. We do not believe the field is yet ripe for recommendations of prenatal clinics with medical service except in selected communities where there is a need and a demand.

2. Well Child Conferences.

We should like to see more generally the pre-school child taken care of in the local well child conferences. In many communities very little is being done for this age group. We should also like to see more well child conferences established and more medical service in connection therewith, the responsibility for provision of the same to be carried by the community and used as a means of educating the parents.

3. Child Health Day.

We are working on the enlargement of our organization plans for May Day-Child Health Day and the Summer Round-Up. The coming year we are to stress the slogan adopted by the American Child Health Association "Parent Cooperation in the Community Program for Child Health and Protection." Therefore, we are changing the method of distribution of the tags and making a difference in the approach to the community for cooperation. This too, will mean an increase in postage and travel for the staff.

4. Public Health Nursing.

The western district is much too large for one nurse to take care of. We are redistributing the communities somewhat, assigning more towns to the consultant nurse covering Worcester County District. However, the time has come when we need to consider seriously adding another consultant nurse to the staff.

In view of the fact of further instruction to the nurses in the field, we should like to have taken under consideration the possibility of an extension course sponsored in whole or in part by this Division.

We hope to extend the lecture service to the nurse training schools and also to foster staff education among visiting nursing association staffs.

We hope to have established in more communities a nursing program that gives a true public health nursing service; also a more universal custom of record-keeping.

5. School Hygiene.

We should like to have more frequent contacts with school physicians in groups and we would present for your consideration the possibility of an Advisory Council on School Hygiene, consisting of school physicians and superintendents of schools, through which a more standardized school medical service may be established in the schools. In relation to this also is the possibility of bringing to the attention of the State Medical Societies the opportunity of cooperating with the school medical service already established. I believe we need a much closer cooperation between the County Medical Societies than we are receiving in relation to the various activities and this is due possibly to the fact that they are not aware of our program as fully as they might be.

We are coming more and more to feel the need for extending the school medical service to the high school age group and plan during the coming year to stress this need in our contacts with the school people.

6. Dental Hygiene.

We should like to add to our dental program a demonstration of preventive work in connection with well child conferences and prenatal clinics, and in the schools in the first and second grades, where they do not have dental service.

7. Nutrition.

We hope to increase our activity along the line of group instruction with teachers, nurses and lay groups, and to carry on further work in connection with the school lunch.

8. Health Education.

There is a possibility of organized health service in Martha's Vineyard and in Franklin County during the coming year, and we should like to further these projects in both these sections of the state.

We plan to revive the bulletin "Tidings" to be issued every second month. This will be written in popular style and will have material of interest to field workers throughout the state. For some time a need has been felt for this type of contact between the Division staff and the local workers interested in health, and we believe that this popular method would add to the relationship between the community and the Division.

Work has been started on a revision of *The Baby and You*. It is planned to have two booklets instead of one, the first to be devoted entirely to the prenatal period, and the second to the care of the baby. This will obviate the necessity of our purchasing prenatal care booklets and certain infant care leaflets from outside organizations.

REPORT OF THE DIVISION OF TUBERCULOSIS.SUMNER H. REMICK, M.D., *Director.*LOUIS N. PHANEUF, *Assistant Director.*PAUL WAKEFIELD, M.D., *Chief of Clinics.*

I have the honor to submit the tenth annual report of the Division of Tuberculosis. This report includes the major activities of the Division for the fiscal year ending November 30, 1929, and certain recommendations for the coming year. The past year has shown continued progress, especially in our hospitalization program, but this program must be properly extended if we are to provide adequate institutionalization.

Never has the demand for sanatorium care been so urgent and our waiting list for admissions so constantly increased. It is indeed fortunate that the increasing demand for hospitalization was recognized in 1928 and that the recommendations of the Department approved by the Legislature are being carried out as rapidly as possible. It is expected that within the coming year two new county hospitals will be completed. These with additions to existing institutions will provide over five hundred additional beds and Massachusetts will then be able to provide 4,300 beds for all forms of tuberculosis or approximately 1.6 beds for each annual death. This ratio, a few years ago, would have been considered ideal, or possibly more than necessary; at the present time it will prove inadequate. Why? First, the constantly increasing percentage of reported cases demanding sanatorium care; second, the increased period of time each patient remains in the institution; third, the development of an intelligent and progressive statewide case-finding machinery for the discovery of tuberculosis in children; fourth, the proposed plans for intensive case-finding in adults. This service will probably be rendered by the state and county sanatoria and will undoubtedly discover hundreds of cases unknown to local health departments. I think this will prove my point that the building program must be continued and should, I believe, reach the ratio of at least two beds for each annual death, within the next few years.

During the past ten years, the efforts of the Division have been directed toward improvement and extension of hospitalization facilities in state, county and municipal institutions. The largest building program in the history of Massachusetts is about to be accomplished. This period has also seen marked changes in the policy of the state sanatoria, viz: that Rutland with its 350 beds now cares for adults with pulmonary disease, while Westfield and North Reading have 600 beds for the care of children with hilum and pulmonary tuberculosis. Lakeville provides 290 beds for cases of non-pulmonary tuberculosis of both adults and children.

The Ten-Year Program of the Department was inaugurated in 1924. Over 100,000 children have been examined. Out-patient departments have been established at all the state sanatoria and, as indicated by their growth, have been well received by physicians and by the public. Social Service has been organized and other activities developed. Much of the above may be designated as institutional service. The next decade should see vast improvements in the extramural service.

A number of important changes have occurred in the personnel of the Division during the past year. Dr. Henry D. Chadwick, after twenty years of notable service as Superintendent of the Westfield State Sanatorium, has resigned to accept a position in the Detroit Health Department. For the first five years, Dr. Chadwick directed the Department's Ten-Year Program, a program that is recognized as one of the most important and progressive steps in the contest against tuberculosis. Dr. Roy Morgan, for many years Assistant Superintendent at the Westfield State Sanatorium, took Dr. Chadwick's place as the head of this institution. Dr. Heman B. Chase, Senior Physician, was promoted to the Assistant Superintendency to fill Dr. Morgan's place. Dr. Lyman Asa Jones, Superintendent of the Pondville Hospital, resigned and was succeeded by Dr. George M. Sullivan who has been associated with the Department for many years, and more recently, as District Health Officer. Dr. David Zacks, Assistant Director of the Division of Tuberculosis, was placed in charge of the important follow-up work of the "Chadwick Clinics." Mr. Louis N. Phaneuf, who for many years

has had charge of the Subsidy Claims and Settlements, succeeded Dr. Zacks as Assistant Director. Miss Mary L. Herman, for many years identified with the Division at the State House, was promoted to succeed Mr. Phaneuf. Dr. Alton S. Pope of the Chicago Health Department was appointed epidemiologist to the Division in November. Dr. Pope has had wide experience and his epidemiological studies will prove of great value in formulating the Department's future activities and policies.

Miss Felicita C. Pellegrini was appointed social worker in April, 1929.

SANATORIA.

The four state sanatoria, Rutland, Westfield, North Reading and Lakeville, have provided 391,161 days of treatment for 2,046 patients, 1,069 of these cases were in the institutions at the beginning of the year and 977 represent admissions. There were 7,690 more hospital days' treatment provided than in 1928, but there was a decrease of 73 patients hospitalized. Again emphasizing the longer period of care and treatment.

The sanatoria have not been able to meet the demand for service and the waiting list for Rutland is constantly growing. This will be reduced as soon as Middlesex and Worcester Counties complete and open their new hospitals, but with its enviable reputation the demand for admission to Rutland will continue.

This institution should, at the earliest possible date, be reserved for the treatment of favorable cases for the entire State. With the increased amount of medical and surgical service provided it is necessary to increase the staff from six to seven physicians. During the past year 117 cases were given pneumothorax, and thoracic surgery was used in 17 cases. A new surgical building is greatly needed at Rutland to carry on this type of work and to provide suitable rooms for X-Ray and dental services.

At Westfield, which has been enlarged and improved, the most pressing needs are greater facilities for the increasing out-patient service; a separate dwelling for the Superintendent, and an employees' building. Plans and estimates have been submitted and we hope that one or more projects will be approved this year.

At North Reading, which has also been enlarged and improved, the new Admission and Isolation Building which is nearing completion will provide excellent rooms for X-Ray equipment, laboratories and the Out-Patient Department on the ground floor. The first and second floors have been admirably arranged for proper isolation of all children admitted. Also provision has been made for the sanatorium care of 28 infants and young children with tuberculosis. A male employees' building is needed, and power plant changes will be necessary.

At Lakeville, with a present capacity of 290 beds, the new children's building will be opened about June 1st. Here excellent accommodations in a very modern building will be provided for 74 children. A special room has been designed for artificial heliotherapy and high intensity carbon arc lamps will be used. Even with this large addition we shall undoubtedly have a number of children remaining on our waiting list. A new building for at least forty patients will be needed as well as new quarters for the Medical Staff.

During the past year numerous alterations and improvements have been made at all the sanatoria. Large appropriations have been made for fire protection. The water supply and storage facilities with high-pressure pumps are adequate for each institution at present. We expect to complete this year the installation of automatic sprinklers in all buildings. Many of these improvements have been charged against the maintenance appropriations and this reflects a corresponding temporary increased per capita cost. The Superintendents are to be congratulated, again, upon the satisfactory way in which their institutions have been carried on. To them and their staffs, I wish to express my sincere appreciation.

For further information regarding the sanatoria, the reader is referred to the annual reports of the Superintendents which follow this report.

PONDVILLE HOSPITAL.

This institution for the treatment of all forms of cancer is now in its third year of service. Since its first few months of service the hospital has been filled to

capacity with many on the waiting list. The Out-Patient Department, established soon after its opening, has shown remarkable growth and need of larger quarters for this service were at once apparent. A new hospital unit with twenty-five additional beds for hospital use and a large and modern Out-Patient Department will be completed early this year. This institution will then have a capacity of 115 beds and with its Out-Patient Department and every modern facility for the treatment of cancer the Commonwealth may indeed feel proud of the service provided for its citizens afflicted with this disease.

The Department has been very fortunate in interesting a large group of eminent physicians to act as consultants. The resident staff of interested and competent physicians has been increased.

During the past year a twelve-months course for nursing attendants was opened. This, we hope may solve the problem of a suitable attendant nursing staff.

The report of Superintendent and of other members of the Department will be found in another section of the Department's Annual Report.

TUBERCULOSIS DISPENSARIES.

Many of the dispensaries are doing exceptionally good work. This is particularly true in some of the larger communities and in a few cities, under 50,000 population, the work is well organized with a competent and interested staff of physicians and nurses. The reports from the Tuberculosis Field Nurses would indicate that in many places the nursing staffs have been greatly improved. This improvement is indicated by better follow-up of patients and reported in better dispensary records. I doubt very much if the work of the dispensaries will ever come up to the expectations of those interested in founding them. There are many reasons for this, chief of which is, that in many instances the physicians appointed lack experience, training and interest in this type of work. With the exception of the larger cities I believe that this service would be much more satisfactorily accomplished by the establishment of an out-patient department in all state and county sanatoria. Each unit could be held responsible for case finding and adequate follow up of all reported cases in a given number of towns in their hospital district. I would suggest that the dispensary physicians in the larger cities be brought together in some form of permanent organization in order to become more familiar with the State's program. Conferences or short courses at one or more of the State Sanatoria would seem advisable. Here the physicians would come in close contact with institution staffs and have an opportunity to see and utilize the newer methods of diagnosis and treatment. The knowledge and inspiration gained at such a conference would, I am sure, enable each dispensary physician to give better service to his community.

FIELD WORK AND RECORDS.

The work of the Tuberculosis Field Nurses has now been well systematized and the four nurses are able to check with local communities and re-locate all reported cases in the Commonwealth at least once a year. This year more effort has been placed upon the educational side of their work and much more time has been spent with the local tuberculosis field nurse. With the exception of the City of Boston, our records are very complete and are kept up to date at all times. This material will prove of value in the statistical studies that are being made by the Department. The nurses in addition to their former tasks are now making home visits to all children that have been recommended for sanatorium care by the Chadwick Clinics. The increased number of children hospitalized well justifies their extra time and effort.

SOCIAL SERVICE.

For some time the Department has recognized the importance of social service work, especially at our children's institutions. We knew that many children were returning to poor and inadequate homes and that a large per cent of this group returned for further treatment in a short time. We feel that a social worker should go into the home of every patient admitted to a state sanatorium as soon as possible after application has been received at the office of the Division. The informa-

tion secured is most useful to the sanatorium physicians, especially when the question of discharging the patient is under consideration. One social service worker has been appointed. Her work has already demonstrated the value of this service and the need of more workers. I believe that we need at least four more: one in the central office and one at each institution.

CHADWICK CLINICS.

Following is the summary of the fifth year of the Ten-Year Program, now known as the Chadwick Clinics:

Number of children examined	25,693
Number of contacts examined	930
Number given Von Pirquet test	25,699
Number of children with positive Von Pirquet (reactors)	7,423
Number of children X-Rayed	7,519
Number of cases diagnosed as Pulmonary Tuberculosis	11
Number of cases diagnosed as Pulmonary Abscess	1
Number of cases diagnosed as Pleurisy	2
Number of cases diagnosed as Hilum Tuberculosis	415
Number of cases classified as Suspects	848
Number of cases X-Rayed and classified as Negatives	6,242
Number of children with enlarged or diseased tonsils and adenoids	10,307
Number of children with defective teeth	17,005
Number of children with heart murmurs	368
Number of cases of malnutrition	2,402

The personnel of the Clinic now numbers twenty-four. This number is divided into three groups. The "main unit" comprises four physicians, two nurses, two nutritionists, three stenographers and two X-Ray technicians. The "follow-up unit" comprises two physicians, two nurses and two stenographers for the annual examination of all positive and suspicious cases of tuberculosis. The third group is an office group of five stenographers and clerks who are engaged in writing reports, recording and filing permanent records.

During the first five years the Chadwick Clinics examined 101,118 children in the grade schools throughout the State. The first three years the examinations were limited to certain selected groups of children, the fourth and fifth years examinations included all children in the grade schools requesting the examination. For the sixth year it has been decided to offer this service to all High School students.

From experience gained in the past five years, it has been decided to change the method of procedure in the Clinics. During the sixth year the procedure will be: after the parent's consent has been obtained for the examination, the tuberculin test will be given, then, when these tests are read, the positive reactors will at once be given an X-Ray of the chest. If the film shows unusual or abnormal markings the child will be given a physical examination and a careful history taken. It will be seen that by this method reactors are quickly and easily sifted out and that we have an X-Ray of the chest of each child that is infected and may show disease. The new method eliminates an enormous amount of work that has been done on a large group of children that have proved non-tuberculous. Further, this method will cause less disturbance in the school building and permits the examination and classification of twice as many children as formerly with the same staff.

As the work continues there is a decided increase in the interest of parents, school and health officials and the Clinics are being recognized as of great value to the Community.

During the past year, clinics have been held in thirty-two cities and towns, as follows:

Palmer, Dover, Cohasset, West Springfield, Norfolk, Natick, Wilmington, Fall River, Milford, Westwood, Medfield, Millis, Wilbraham, Longmeadow, Taunton, Raynham, Bedford, North Reading, Southboro, Westboro, Ashland, Shrewsbury, Boylston, Millville, Blackstone, Amesbury, Burlington, Boxford, Hopkinton, Wrentham, Swampscott and Marblehead.

SUBSIDY.

I have previously recommended the repeal of the subsidy law. This recommendation has never received legislative approval. Since payments of subsidy must continue, I would recommend an amendment to the present law which would allow the Department to draw up certain standards of tuberculosis control as indicated after a survey of the local tuberculosis situation.

For the year ending November 30, 1929, there have been received 2,419 claims for subsidy from 121 cities and towns. Of this number 2,131 claims, amounting to \$261,156.30 were allowed and paid.

LAKEVILLE STATE SANATORIUM.

RESIDENT OFFICERS.

LEON A. ALLEY, M.D., *Superintendent*.
 PETER FERRINI, M.D., *Senior Physician*.
 GEORGE L. PARKER, M.D., *Senior Physician*.
 SAMUEL SEGAL, M.D., *Assistant Physician*.
 EMANUEL KLINE, D.M.D., *Dentist*.
 CHIN S. CHANG, M.D., *Junior Bacteriologist*.
 CAROLINE T. WHITE, R.N., *Superintendent of Nurses*.
 MARY C. O'CONNELL, *Head Teacher*.
 KATHERINE NUTE, *Head Occupational Therapist*.
 FLORENCE S. MONROE, *Treasurer*.
 SUSAN M. MURPHY, *Head Housekeeper*.
 CHESTER TAYLOR, *Steward*.
 ROBERT A. KENNEDY, *Chief Power Plant Engineer*.
 THOMAS FRANCIS MAHONY, *Head Farmer*.

NON-RESIDENT OFFICERS.

ZABDIEL B. ADAMS, M.D., *Orthopedic Consultant*.
 LOUIS A. O. GODDU, M.D., *Orthopedic Consultant (Alternate)*.

Report of the Superintendent.

To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health*.

I have the honor to submit the twentieth annual report of the Lakeville State Sanatorium for the year ending November 30, 1929. During the year there has been expended \$239,798.78 for maintenance, a gross weekly per capita cost of \$21.68518. There has been collected from miscellaneous sources, (the total of all collections) \$84,324.89. Deducting this amount from the gross maintenance expense, leaves a net expense of \$155,473.89 and a net weekly per capita cost of \$14.05962. There has been collected from private sources \$5,565.00, from Cities and Towns \$76,101.50, from the State Board of Retirement \$27.12, and from Sales \$2,631.27.

There were 35 patients supported wholly or in part by private funds, 235 by Cities and Towns, 72 wholly by the State, 2 State Wards and 23 patients on whom settlement has not been determined.

From the appropriation of \$1,500.00 for Water Supply as authorized by Chapter 127, Acts of 1928, there was expended during 1929, \$901.65. Not completed. From appropriation of \$25,000.00 for Surgical Building as authorized by Chapter 138, Acts 1927, there was expended prior to 1929, \$24,640.50; during 1929, \$98.23. Total, \$24,738.73. Reverted to State Treasury, \$261.27. This work has been completed. From appropriation of \$45,000 for Sewage Disposal as authorized by Chapter 127, Acts of 1928, there was expended prior to 1929, \$23,050.31; during 1929, \$21,889.94. Total, \$44,940.25. Not completed. From appropriation of \$8,700.00 for addition to Fire Protection as authorized by Chapter 127, Acts 1928, and Chapter 146, Acts 1929, there was expended during 1929, \$4,714.67. Not completed. From appropriation of \$22,000.00 for Remodeling South Pavilion as authorized by Chapter 127, Acts 1928, there was expended prior to 1929, \$20,753.00; during 1929, \$506.40. Total, \$21,259.40. Not completed. From appropriation of \$56,800.00 for Nurses' Home as authorized by Chapter 127,

Acts 1928, there was expended prior to 1929, \$18,430.77; during 1929, \$36,449.80. Total, \$54,880.57. Not completed. From appropriation of \$15,000.00 for Engine Room as authorized by Chapter 127, Acts 1928, there was expended prior to 1929, \$9,080.62; during 1929, \$5,899.34. Total, \$14,979.96. Not completed. From appropriation of \$8,000.00 for Steamline as authorized by Chapter 127, Acts 1928, there was expended prior to 1929, \$3,100.00; during 1929, \$3,100.00. Total, \$6,200.00. Completed. From appropriation of \$132,500.00 for Children's Building as authorized by Chapter 146, Acts 1929, there was expended during 1929, \$23,110.83. Not completed.

There were 201 patients in the Sanatorium at the beginning of the year, December 1, 1928, and 218 patients at the close, November 30, 1929. The largest number present at one time was 222, and the smallest 195. The daily average number of patients was 212.6574, 8,7148 more than last year. Daily average number of bed patients was 169.5533 — children 104.0931, adults 65.4602. There were 163 patients admitted during the year. For the classification of patients admitted, your attention is called to "Table No. 7." The average age of patients admitted was 23 years. Including deaths there were 149 patients discharged, and the average duration of residence was 363 days. Of those discharged 95 patients gained 1375.71 pounds, an average gain of 14.48 pounds per person. Of those discharged there were 53 arrested, 1 apparently arrested, 3 quiescent, 47 improved, 14 unimproved, 22 deaths, 3 not considered (duration of treatment being less than one month) 6 non-tuberculous. There were 77,620 hospital days of treatment, 6,637 hospital days more than for 1928.

APPOINTMENTS AND RESIGNATIONS.

Dr. Harold Ragolsky, Assistant Superintendent, resigned April 30, 1929 to take up orthopedic work at the Boston City Hospital. Dr. Henry Bloom resigned May 31, 1929 to take up a post graduate course in Vienna. Dr. George L. Parker, graduate of Tufts Medical School was appointed Assistant Physician May 8, 1929. Dr. Samuel Segal, graduate of Boston University School of Medicine, was appointed Assistant Physician July 3, 1929.

MEDICAL REPORT.

The weekly staff meetings have been continued throughout the year. These meetings have been of great assistance in solving many of the problems and establishing uniform policies between the services. In addition to these meetings an evening monthly meeting has been held for the presentation and discussion of medical subjects, each member of the resident staff abstracting one or more of the current medical journals.

Absolute rest treatment with complete immobilization of the diseased structures to arrest active disease has been continued during the year. This type of pre-operative care has resulted in very satisfactory results in the orthopedic cases which have made up 58% of admission and 57% of discharged cases. Orthopedic surgery at the proper time in this group of cases followed by six to eighteen months of post-operative treatment has helped in no small measure to diminish the great waste of time and enormous cost to the community of less well organized procedures and routine methods of treatment. That the closest cooperation between the medical man and the orthopedic surgeon is of the greatest importance has again been demonstrated throughout the year. We are convinced that in a very large percentage of patients suffering with joint tuberculosis elimination of motion in the tuberculous joint is the essential means of affecting a cure. The most effective and quickest means of putting these joints at rest completely and permanently is operative fusion. This not only gives the patient a limb that can be used with comparative safety so far as local recrudescence is concerned but also eliminates one of the great dangers of metastasis.

General sanatorium treatment plus natural and artificial heliotherapy have produced excellent and very satisfactory results in the majority of our patients during the past year. Recognizing tuberculosis in any form as a general constitutional disease it has been clearly demonstrated that the treatment of any form of tuberculosis is primarily general sanatorium treatment. The recovery of the patient rests upon that as its foundation.

Delay in the early hospitalization of some patients has resulted in the necessity of amputation of extremities in some cases. We trust there will be fewer of this type of case in the future.

We still feel the need of artificial heliotherapy on a larger scale than we now have available. The facilities which will be available upon the completion of the new Children's Building now under construction, should result in further shortening the institutional life of the patient by making available artificial heliotherapy for a large group of patients.

We have been fortunate in having but three cases of contagious diseases during the past year among our employees, none among the patients. Two employees had smallpox and one developed scarlet fever. The value of the immunization policy carried on among both patients and employees was clearly demonstrated during the smallpox epidemic in the vicinity of the sanatorium last spring. Two employees residing outside the institution developed smallpox during the first ten days of their employment here. In spite of the contact of other employees with those two individuals, no case of smallpox developed among the rest of the personnel, all of whom had been previously vaccinated.

The laboratory has continued its work in identifying the different strains of tubercle bacilli causing the various types of tuberculous lesions admitted during the year. The last tabulation shows approximately 33% due to the bovine type and 67% due to invasion by the human type of tubercle bacilli.

During the year 1929, the Superintendent gave five lectures illustrated by lantern slides and wrote two papers for publication.

Operations, Casts, Consultation Examinations.

Operations.

The following operations were performed during the year:

Arthrodesis of knee	5	Exploratory laparotomy	1
Arthrodesis of spine	3	Plastic surgery	1
Arthrodesis of hip	9	Tonsillectomies	13
Arthrodesis of hand	1	Incision and drainage	1
Arthroplasty	1	Blood transfusion	1
Amputations	6	Inversion of skin flaps	1
Ostectomy	1		
Osteotomies	4	Total Operations	50
Appendectomies	2		

Casts.

Plaster casts for the year were as follows (types classified):

Forearms	14	Spica (double without jacket)	28
Toes to knees (boots)	28	Jackets (spine straight)	104
Groin to ankle (cylinder)	40	Casts for hands (incl. wrists)	8
Shells	4		
Spica (single)	99	Total Casts	345
Spica (double incl. spine with jacket)	20		

Consultation Examinations.

	Positive.	Deferred.	Total.
Fall River Tuberculosis Hospital, Fall River, Mass.	7	2	9

Patients examined at the sanatorium:

	Positive.	Negative.	Re-exam.	Total.
Out-patients	15	15	1	31
Employees	2	7	—	9
	17	22	1	40

Total Examinations, 49.

*Proven Tuberculosis — Concluded**Diagnosis — Concluded*

Number.

Tuberculous Leg	2
Tuberculous Elbow	1
Tuberculous Sacro-Iliac Joint	3
Tuberculous Meninges	2
Tuberculous Chest	1
Tuberculous Skin	1
Tuberculous Intestine	1
Tuberculous Empyema	1
Tuberculous Foot	2
Tuberculous Sinus	1
	<hr/>
	65

X-Rays.

Number of X-Rays taken from December 1, 1928, to November 30, 1929 . . . 692

Photographs.

Number of photographs taken from December 1, 1928, to November 30, 1929 . . . 192

DENTAL REPORT, FROM DECEMBER 1, 1928, TO NOVEMBER 30, 1929.

Examinations	225
Prophylaxis treatments	136
Fillings:	
Permanent teeth	402
Temporary teeth	25
Extractions:	
Permanent teeth	179
Temporary teeth	98
Treatments	627
Restorations:	
Dentures	14
Crowns	1
Inlays	2
Radiographs	91
Irrigations	147
Vincent's infection	33
Root canal treatments	15
Pulpectomys	4
General anesthesia	17
	<hr/>
Total operations	2,016
Visits	992
New patients	204
Dismissals	123

Following is a brief outline of the policies of the Dental Department:

1. To make a thorough oral examination of every patient admitted to the hospital.

2. To do oral prophylaxis within a few days after admission on every patient whose condition warrants dental treatment.

3. To do remainder of necessary dental treatment at subsequent sittings in the order following:

- (a) Relief of pain.
- (b) Treatment of oral infection.
- (c) Radiographs of doubtful teeth.
- (d) Fillings.
- (e) Extractions.
- (f) Restorations.

4. To dismiss all completed mouths for a period of six months and at the termination of this time the routine is again repeated.

5. To re-examine all patients previous to discharge whether completed cases or not.

The patients are instructed in the value of oral hygiene and the necessity of maintaining good, clean, healthy mouths. Every effort is made to prevent pain, the following methods being used:

Adults

Novocaine — injections, infiltration and conduction anesthesia.

Ethyl chloride, local anesthesia.

Gas oxygen and ether, general anesthesia.

Children

Novocaine — injections, infiltration and conduction anesthesia.

Ethyl chloride, general anesthesia.

With the continued cooperation of the patients and the nursing staff, it has been made possible to greatly decrease the number of low grade infections, which were present a year ago. By constant instruction and enforcement of the simple rules for maintenance of oral hygiene, a marked improvement has been made in the condition of the mouths of the majority of the patients.

Another gratifying result is the willingness of the patients, both child and adult, to make regular visits to the dental room, which is probably due to the strict adherence, on the operator's part, of either a local or general anesthetic in cases where any pain is anticipated.

EDUCATION.

There has been a marked increase in the activities with the patients by the Department of Occupational Therapy and since September four students from the Boston School of Occupational Therapy have been receiving training here, which is an increase of two over previous years. The patients in turn get the benefit of much more personal instruction from these added workers. With the types of patients under treatment at this Sanatorium but very little class instruction is practical.

The school work with the children has shown excellent results.

FARM.

The activities on the farm have been satisfactory with the exception of the hay crop. This crop was below the usual yield on account of very dry weather. It will be necessary to purchase some hay in 1930. The size of the herd has been increased to meet the additional requirements of the Sanatorium. The herd continues to be accredited. The poultry plant has provided all the eggs and poultry for meat used during the year.

Clearing of the water shed has been continued at Clear Pond, the source of our water supply, and considerable land is now available for planting pine seedlings. This work will be continued in suitable weather through the winter.

The new sewage disposal system was completed early in the year and is operating satisfactorily.

Substantial additions have been made to the fire protection system and this work has now progressed to such point that another year's additions should complete the requirements.

IMPROVEMENTS AND CHANGES.

The Nurses' Home, construction of which was begun in 1928, was completed and opened for occupancy in June of this year. These additional quarters have greatly relieved the serious congestion previously experienced in housing employees of the nursing department.

Ground was broken for the erection of the new Children's Building in September 1929. Thus far the work has progressed satisfactorily.

LIBRARY.

Through the assistance and cooperation of the General Secretary of the Division of Public Libraries, a Sanatorium Library was instituted during the past year and the services of Miss Edith Ames, Librarian of Bridgewater Library, obtained. Several hundred books, magazines and current periodicals are now available for the use of our patients. The Librarian comes to the Sanatorium one afternoon each week and distributes and changes the reading material through the wards. The service is much appreciated and enjoyed by the patients.

ENTERTAINMENTS.

Moving pictures and radio have furnished most of the entertainment for the patients during the year. As our patients cannot go to the Assembly Hall for entertainments, we cannot take advantage of the various plays and minstrel shows available from neighboring organizations.

RELIGION.

Services have been held in the Chapel and in the wards by the Catholic, Protestant and Jewish Chaplains during the year.

RECOMMENDATIONS.

A new Laundry Building with modern equipment is badly needed and should be provided at an early date.

Additional kitchen and dining room space is needed to meet the demands of the growth of the institution. A small addition and equipment is therefore recommended to our present kitchen. New tile and terrazo floors should be laid throughout the kitchen and dining rooms.

To house properly the additional members of the medical staff, needed with the opening of the new Children's Building, the quarters occupied at present by the Superintendent should be remodeled to provide a new staff dining room and living quarters for the Assistant Superintendent. This would require the erection of a house for the Superintendent, which is recommended. As additional office space is needed, a portion of the present quarters of the Superintendent could be easily converted for that purpose.

It is strongly recommended that the fire protection system be completed during the coming year.

ACKNOWLEDGMENTS.

For the many donations from interested friends, I beg to express the appreciation of the patients and personnel of the entire institution.

The cooperation and assistance of the consulting staff has been of great benefit to us in making our patients more comfortable and has materially assisted toward their recovery.

Your continued confidence and inspiration as well as the faithful efforts of many loyal employees have made possible a year of satisfactory service to the citizens of the Commonwealth.

Respectfully submitted,

LEON A. ALLEY, M.D.

Superintendent.

POPULATION.

	Males.	Females.	Boys.	Girls.	Totals.
Number received during the year	52	30	45	36	163
Number passing out of the institution during the year	56	33	32	28	149
Number at end of the fiscal year in the institution	50	29	78	61	218
Daily average attendance (number inmates actually present during the year)	55.1479	32.2082	70.8630	54.4383	212.6574
Average number of employees and officers during the year	92.0000	52.2383	-	-	144.2383

EXPENDITURES.

Current Expenditures:

Salaries	\$135,169 69	
Food	34,076 48	
Medical and General Care	7,402 77	
Farm	15,843 45	
Heat, Light and Power	14,143 12	
Garage, Stable and Grounds	2,502 78	
Travel, Transportation and Office Expense	2,782 69	
Religious Instruction	1,360 00	
Clothing and Materials	458 89	
Furnishing and Household Supplies	14,330 81	
Repairs Ordinary	3,297 61	
Repairs and Renewals	8,430 49	
		\$239,798 78

Extraordinary Expenses (Permanent Improvements):

Water System (Chapter 127, Acts 1928)	\$901 65	
Surgical Building (Chap. 138, Acts 1927)	98 23	
Sewage Disposal (Chap. 127, Acts 1928)	21,889 94	
Addition to Fire Protection (Chapter 127, Acts 1928; Chap. 146, Acts 1929)	4,714 67	
Remodeling South Pavilion (Chap. 127, Acts 1928)	506 40	
Nurses' Home (Chapter 127, Acts 1928)	36,449 80	
Engine Room (Chapter 127, Acts 1928)	5,899 34	
Steamline (Chapter 127, Acts 1928)	3,100 00	
Children's Bldg. (Chap. 146, Acts 1929)	23,110 83	
		96,670 86

Grand Total \$336,469 64

Summary of Current Expenses.

Total Expenditures	\$336,469 64	
Extraordinary Expenses, Deducted	96,670 86	
		\$239,798 78
Deducting amount of sales		2,631 27
		\$237,167 51

Dividing this amount by the daily number of patients 212.6574, gives a cost for the year of \$1,115.2563, equivalent to an average weekly net cost of \$21.44723.

VALUATION.

Land.

Grounds, 50 acres	\$7,955 30	
Lawns and Buildings, 48 acres	535 70	
Roads, 2 acres		
Woodland, 10 acres	1,730 37	
Mowing, 34 acres	4,311 81	
Tillage, 49 acres		
Tillage, 30 acres		
Garden, 19 acres		
Orchard, 8 acres	611 65	
Pasture, 41 acres	1,816 41	
Waste and Miscellaneous, 17 acres	942 27	
Meadow, pasture and swamp land, 16 acres		
Coal Trestle, 1 acre		
		\$17,903 51
New Sewage Disposal	45,000 00	
		\$62,903 51

Buildings.

Institution Buildings	\$406,688 83	
Farm, Stable and Grounds	55,373 26	
Miscellaneous	157,581 48	
		\$682,547 08
Present value of all personal property	12,486 17	
Grand Total		\$695,033 25

Statistical Tables

TABLE 1. — Admissions and Discharges.

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Males.	Females.	
Patients in the sanatorium Nov. 30, 1928	49	30	70	55	204
Patients admitted Dec. 1, 1928, to Nov. 30, 1929	52	30	45	36	163
Patients discharged Dec. 1, 1928, to Nov. 30, 1929	56	33	32	28	149
Patients remaining in the sanatorium Nov. 30, 1929	50	29	78	61	218
Daily average number of patients	55.1479	32.2082	70.8630	54.4383	212.6574
Deaths (included in number discharged)	10	4	3	5	22

TABLE 2. — *Civil Condition of Patients admitted.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Males.	Females.	
Single	20	18	45	36	119
Married	30	11	—	—	41
Widowed	2	1	—	—	3
	52	30	45	36	163

TABLE 3. — *Age of Patients admitted.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Males.	Females.	
1 to 13 years	—	—	27	20	47
13 to 17 years	—	—	9	9	18
17 to 20 years	—	—	7	5	12
20 to 30 years	21	14	2	2	39
30 to 40 years	16	7	—	—	23
40 to 50 years	5	5	—	—	10
Over 50 years	10	4	—	—	14
	52	30	45	36	163

TABLE 4. — *Nativity and Parentage of Patients Admitted.*

	ADULTS.						CHILDREN.						TOTALS.		
	MALES.			FEMALES.			MALES.			FEMALES.					
	Patient.	Father.	Mother.	Patient.	Father.	Mother.	Patient.	Father.	Mother.	Patient.	Father.	Mother.	Patient.	Father.	Mother.
United States:															
Massachusetts	31	6	7	16	3	5	39	11	19	27	8	7	113	28	38
Other New Eng. States	3	5	6	2	2	2	—	2	—	1	—	—	6	9	8
Other States	3	4	3	—	2	1	4	6	4	1	—	—	8	12	8
	37	15	16	18	7	8	43	19	23	29	8	7	127	49	54
Other Countries:															
Armenia	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—
Austria	1	2	2	—	—	—	—	—	—	—	—	—	1	2	2
Canada	2	7	6	3	5	4	—	4	2	5	5	4	10	21	16
Denmark	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
England	—	2	2	—	—	—	—	2	1	—	—	1	—	4	4
Finland	1	1	1	—	—	—	—	2	2	—	—	—	1	3	3
Greece	2	2	2	—	—	—	—	3	2	—	1	1	2	6	5
Germany	—	—	—	—	1	1	—	—	1	—	—	—	—	1	2
Hungary	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—
Ireland	3	9	11	4	8	8	—	—	—	—	1	2	7	18	21
Italy	1	3	3	3	4	4	1	7	6	1	8	7	6	22	20
Lithuania	1	2	2	—	—	—	—	—	—	—	1	1	1	3	3
Poland	1	—	—	—	—	1	—	2	2	—	5	5	1	7	8
Portugal	1	2	2	1	1	1	—	2	—	—	2	2	2	7	5
Russia	1	2	2	—	1	1	—	2	2	1	2	2	2	7	7
Scotland	—	1	—	—	1	—	—	—	—	—	1	—	—	3	—
Sweden	1	2	2	—	—	—	—	—	—	—	—	1	1	2	3
Syria	—	—	—	1	1	1	—	—	—	—	1	1	1	2	2
Turkey	—	—	—	—	—	—	1	2	2	—	—	—	1	2	2
Unknown	—	2	1	—	—	1	—	—	2	—	—	1	—	2	5
	52	52	52	30	30	30	45	45	45	36	36	36	163	163	163

TABLE 5. — *Residence of Patients Admitted.*

	Adults.	Children.	Totals.
Abington	1	—	1
Adams	1	—	1
Arlington	1	1	2
Athol	2	—	2
Ayer	1	—	1
Bedford	1	—	1
Boston	27	25	52
Bridgewater	—	1	1
Brockton	1	1	2
Brookline	2	1	3
Cambridge	3	1	4
Chelmsford	—	1	1
Concord	—	1	1
Dedham	—	1	1

TABLE 5. — *Residence of Patients Admitted* — Concluded.

	Adults.	Children.	Totals.
Everett	3	—	3
Fall River	—	1	1
Fitchburg	1	1	2
Foxborough	1	—	1
Haverhill	2	3	5
Holliston	1	—	1
Holyoke	—	1	1
Hopedale	—	1	1
Hudson	1	—	1
Gardner	1	—	1
Lawrence	—	8	8
Lowell	2	5	7
Lynn	2	1	3
Malden	4	3	7
Mansfield	1	—	1
Marlborough	—	1	1
Medford	2	1	3
Melrose	1	—	1
Methuen	—	1	1
Middleborough	2	1	3
New Bedford	1	1	2
Newburyport	—	1	1
Newton	—	1	1
Newton Lower Falls	1	—	1
Norwood	1	—	1
Plymouth	—	2	2
Salem	3	—	3
Scituate	1	—	1
Somerville	2	1	3
Springfield	1	—	1
Stoneham	—	1	1
Taunton	—	3	3
Tisbury	—	1	1
Turners Falls	1	—	1
Waltham	—	1	1
Watertown	3	1	4
Webster	1	—	1
Wilmington	1	—	1
Woburn	—	1	1
Worcester	2	6	8
	82	81	163

TABLE 6. — *Occupations.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Males.	Females.	
Automobile Electrician	1	—	—	—	1
Bookkeeper	1	1	—	—	2
Bricklayer	1	—	—	—	1
Canvasser	—	1	—	—	1
Carpenter	1	—	—	—	1
Chauffeur	1	—	—	—	1
Child	—	—	15	8	23
Cigar Maker	1	—	—	—	1
Clerk:					
General	—	—	1	—	1
Office	1	1	—	—	2
Store	1	—	—	—	1
Cook	2	—	—	—	2
Dressmaker	—	3	—	—	3
Engineer	1	—	—	—	1
Engineer Apprentice	—	—	1	—	1
Factory:					
Paper	3	—	—	—	3
Rubber	—	—	—	1	1
Farmer	1	—	—	—	1
Fireman	1	—	—	—	1
Home, At	—	2	1	—	3
Hosemaker	1	—	—	—	1
Housemaid	—	2	—	1	3
Housewife	—	11	—	—	11
Housework	—	3	—	1	4
Insurance Agent	1	—	—	—	1
Laborer	5	—	—	—	5
Laundry Worker	1	—	—	—	1
Leather Cutter	2	—	—	—	2
Letter Carrier	1	—	—	—	1
Machinist	1	—	—	—	1
Marshmallow Paste Mixer	—	—	1	—	1
Mechanic	2	—	—	—	2
Newsdealer	1	—	—	—	1
Nurse:					
Graduate	—	1	—	—	1
Pupil	—	1	—	—	1

TABLE 6. — *Occupations — Concluded.*

	ADULTS.		CHILDREN.		Totals.
	Males.	Females.	Males.	Females.	
Orderly	1	—	—	—	1
Packer:					
Cracker	—	2	—	—	2
Chocolate	—	1	—	—	1
Meat	1	—	—	—	1
Porter	1	—	—	—	1
Real Estate man	1	—	—	—	1
Repair man	1	—	—	—	1
Salesgirl	—	—	—	1	1
Salesman	3	—	—	—	3
School	3	—	24	23	50
Shipper	—	—	1	—	1
Shoe Shop	3	—	1	—	4
Storekeeper	3	—	—	—	3
Telephone Operator	1	1	—	—	2
Toolmaker	1	—	—	—	1
Towerman	1	—	—	—	1
Typist	—	—	—	1	1
Waiter	1	—	—	—	1
Total	52	30	45	36	163

Total number of Occupations, 53.

TABLE 7. — *Stage of Disease on Admission.*

	ADULTS.		CHILDREN.		Totals.	Per-centage.
	Males.	Females.	Males.	Females.		
<i>One Lesion.</i>						
Tb. Adenitis, Cervical	—	3	3	3	9	5.52
Tb. Ankle	1	2	—	—	3	1.84
Tb. Anus	2	—	—	—	2	1.23
Tb. Bowels	—	1	—	—	1	.613
Tb. Dactylitis	—	—	1	—	1	.613
Tb. Elbow	1	—	—	1	2	1.23
Tb. Foot	1	—	—	1	2	1.23
Tb. Hip	6	—	5	4	15	9.20
Tb. Intestine	1	—	—	—	1	.613
Tb. Knee	—	—	2	1	3	1.84
Lupus Vulgaris	—	1	3	2	6	3.68
Tb. Nephritis	4	1	—	—	5	3.07
Tb. Orchitis	1	—	—	—	1	.613
Tb. Ovary	—	1	—	—	1	.613
Tb. Peritonitis	3	4	4	3	14	8.59
Tb. Phlyctenular Keratitis	—	—	—	1	1	.613
Tb. Prostate	1	—	—	—	1	.613
Tb. Pulmonary	1	—	1	—	2	1.23
Tb. Sacro-iliac	6	—	—	—	6	3.68
Tb. Salpingitis	—	1	—	—	1	.613
Tb. Shoulder	—	—	1	—	1	.613
Tb. Spine	11	5	11	10	37	22.70
Tb. Symphysis Pubis	1	—	—	—	1	.613
Tb. Ulcers of leg	—	1	—	—	1	.613
Tb. Uveitis	—	1	—	1	1	.613
Tb. Wrist	2	1	—	—	3	1.84
	42	21	31	27	121	—
<i>Two Lesions.</i>						
Tb. Adenitis Cervical, Tb. Hip	—	—	1	—	1	.613
Tb. Adenitis Cervical, Pulmo- nary Tb.	—	1	—	—	1	.613
Tb. Adenitis Axillary, Tb. ster- num	—	1	—	—	1	.613
Tb. Ankle, Tb. Dactylitis	—	—	1	—	1	.613
Tb. Ankle, Tb. Knee	—	—	—	1	1	.613
Tb. Elbow, Tb. Spine	1	—	—	—	1	.613
Tb. Ischium, Tb. Pubis	—	—	1	—	1	.613
Tb. Nephritis, Tb. Bladder	—	—	1	—	1	.613
Tb. Nephritis, Tb. Nephrectomy incision	1	—	—	—	1	.613
Tb. Peritonitis, Tb. Salpingo- oophoritis	—	1	—	—	1	.613
Tb. Spine, Tb. Foot	—	—	—	1	1	.613
Tb. Spine, Tb. Hip	1	—	—	1	2	1.23
Tb. Spine, Tb. Knee	—	—	1	—	1	.613
Tb. Spine, Tb. Nephritis	—	1	—	—	1	.613
Tb. Spine, Pulmonary Tuber- culosis	1	2	—	—	3	1.84
Tb. Wrist, Tb. Hip	—	—	1	—	1	.613
	4	6	6	3	19	—

TABLE 7. — *Stage of Disease on Admission — Concluded.*

	ADULTS.		CHILDREN.		Totals.	Per-centage.
	Males.	Females.	Males.	Females.		
<i>Three Lesions.</i>						
Tb. Adenitis Cervical, Axillary, Pulmonary Tuberculosis	1	—	—	—	1	.613
Tb. Adenitis Cervical, Tb. Epididymitis, Tb. Scrotum	—	—	1	—	1	.613
Tb. Nephritis, Tb. Knee, Pulmonary Tb.	—	1	—	—	1	.613
Tb. Spine, Phlyctenular Keratitis, Mitral Stenosis	—	—	—	1	1	.613
Tb. Spine, Tb. Skin, Tb. Abscess Right Buttock	—	—	—	1	1	.613
	1	1	1	2	5	—
<i>Four Lesions.</i>						
Tb. Nephritis, Tb. Bladder, Pulmonary Tb., Genital Tb.	1	—	—	—	1	.613
Tb. Nephritis, Tb. Spine, Tb. Sternum, Pulmonary Tb.	—	1	—	—	1	.613
Tb. Peritonitis, Tb. Chronic Enteritis and Colitis, Dermatitis of Hands	—	—	1	—	1	.613
	1	1	1	—	3	—
<i>Five Lesions.</i>						
Tb. Otitis Media, Tb. Bones of both Ankles and Phalanges of both Hands	—	—	—	1	1	.613
Tb. Spine, Tb. Ulcers, region of Heads of Femurs and both Knees	—	—	—	1	1	.613
	—	—	—	2	2	—
<i>Six Lesions.</i>						
Tb. Skin, Tb. Dactylitis, Tb. Bones both Feet, Tb. Adenitis Cervical and Groin	—	—	1	—	1	.613
<i>Non-Tuberculous.</i>						
Adenitis Cervical	—	—	1	1	2	1.23
Arthritis	—	—	1	—	1	.613
Empyema	—	1	—	—	1	.613
Chronic Osteomyelitis	1	—	1	—	2	1.23
Structural Scoliosis	—	—	—	1	1	.613
Spinal Disease	2	—	—	—	2	1.23
Retroperitoneal Abscess	1	—	—	—	1	.613
Unclassified	—	—	2	—	2	1.23
	4	1	5	2	12	—

TABLE 8. — *Condition on Discharge.*

	ADULTS.		CHILDREN.		Totals.	Per-centage.
	Males.	Females.	Males.	Females.		
Arrested	10	13	13	17	53	35.57
Apparently Arrested	—	—	1	—	1	.67
Quiescent	1	1	—	—	3	2.01
Improved	27	10	7	3	47	31.54
Unimproved	7	5	1	1	14	9.40
Deaths	10	4	3	5	22	14.77
Not Considered	1	—	2	—	3	2.01
Non-Tuberculous	—	—	4	2	6	4.03
	56	33	32	28	149	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	ADULTS.		CHILDREN.		Totals.	LENGTH OF RESIDENCE IN SANATORIUM.				
						ADULTS.		CHILDREN.		
	MALES.	FE-MALES.	MALES.	FE. MALES.		MALES.	FE-MALES.	MALES.	FE-MALES.	Totals.
MONTHS.										
Less than 1	—	—	—	—	—	—	1	1	2	4
1 to 2	—	—	—	—	—	2	1	—	1	4
2 to 3	—	—	—	—	—	—	1	—	—	1
3 to 4	—	—	—	—	—	1	—	—	—	1
4 to 5	1	—	—	—	1	—	—	1	—	1
5 to 6	—	—	—	1	1	—	—	—	—	—
6 to 7	1	2	2	—	5	2	—	—	—	2
7 to 8	—	—	—	—	—	—	—	—	1	1
9 to 10	—	—	—	1	1	—	—	—	—	—
12 to 18	—	1	—	—	1	2	—	1	—	3
18 to 24	—	—	—	—	—	—	1	—	—	1
Over 2 years	8	1	1	3	13	3	—	—	1	4
	10	4	3	5	22	10	4	3	5	22

TABLE 10. — *Cause of Death.*

	ADULTS.		CHILDREN.		Totals.
	MALES.	FEMALES.	MALES.	FEMALES.	
Tb. Ankle, Tb. Meningitis	—	1	—	—	1
Tb. Ankle, Tb. Retroperitoneal Glands	—	1	—	—	1
Tb. Hip	1	—	—	—	1
Tb. Hip, Chronic Myocarditis	1	—	—	—	1
Tb. Peritonitis	—	—	—	2	2
Tb. Peritonitis, Tb. Chr. Enteritis and Colitis,	—	—	—	—	—
Dermatitis of Hands	—	—	1	—	1
Tb. Peritonitis, Tb. Meningitis	—	—	1	—	1
Pulmonary Tb., Tb. Kidney and Bladder	1	—	—	—	1
Pulmonary Tb., Tb. Sacro-iliac	1	1	—	—	2
Tb. Retroperitoneal Abscess, Cardiac failure	1	—	—	—	1
Renal Tb., Tb. Spine	2	—	—	—	2
Tb. Sacro-iliac, Tb. Meningitis	1	—	—	—	1
Tb. Sacro-iliac, Chronic Parenchymatous	—	—	—	—	—
Nephritis	—	—	1	—	1
Tb. Spine	—	1	—	1	2
Tb. Spine, Tb. Elbow, Tb. Meningitis	1	—	—	—	1
Tb. Spine, Chronic Myocarditis	1	—	—	—	1
Tb. Spine, Chronic Nephritis	—	—	—	1	1
Tb. Spine, Tb. Ulcers region Heads of Femurs	—	—	—	1	1
of both Knees	—	—	—	—	—
	10	4	3	5	22

NORTH READING STATE SANATORIUM.

RESIDENT OFFICERS.

CARL C. MACCORISON, M.D., *Sanatorium Superintendent.*EARLE C. WILLOUGHBY, M.D., *Assistant Superintendent.*GERALD H. CARON, M.D., *Assistant Physician.*DOROTHEA F. WHITNEY, M.D., *Assistant Physician.*JAMES H. POWERS, D.M.D., *Dentist.*ETHEL M. KNIGHT, *Senior Bookkeeper.*ELLEN MURRAY, R.N., *Superintendent of Nurses.*ELIZABETH HASLETT, *Head Housekeeper.*J. ELLIS DOUCETTE, *Sanatorium Steward.*DANIEL J. SCOTT, *Chief Power Plant Engineer.*EDWARD J. LEARY, *Head Farmer.*

Report of the Superintendent.

To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the 19th annual report of the North Reading State Sanatorium for the year ending November 30, 1929.

At the close of the last fiscal year we were facing a second epidemic of scarlet fever. On December 1, 1928, there were nine cases of the disease being treated

in improvised isolation wards at the school house. From December 1, 1928, to January 30, 1929, twenty-five more cases were treated in these wards. The epidemic was light, although one severe case in a girl 17 years of age proved fatal. The percentage of complications, however, was less than in the epidemic of the previous winter. Seven employees (six nurses and one waiter) developed the disease.

The following complications were noted, — otitis media 4; cervical adenitis 1; arthritis 4; (probably due to some serum) anaphylaxis from antitoxin (test for sensitivity being negative) 1; cardiac 3; mastoiditis 1; sinusitis 11.

In addition to the above, 102 patients were isolated and treated in improvised wards at the school house. These cases presented throat or ear symptoms but none showed rash or desquamation, although 49% had throat cultures positive for hemolytic streptococci; one had an ear culture and another a nose culture, positive for hemolytic streptococci.

Following the epidemic of scarlet fever, the children were permitted to go home for the Easter vacation. They returned April 4. On April 22, a little girl on Pavilion B West, who had been home, developed a cough, and on the 27th a definite whoop was noted. She was immediately isolated and pertussis vaccine was given to all boys and girls who had come into contact with her.

The second case developed on Pavilion B West sixteen days later, May 13. The disease did not appear in the boys' ward until May 22. From this time on 27 cases developed; 9 female and 20 male were treated for whooping cough during the epidemic. Twenty-three female patients who gave a history of not having had whooping cough (seventeen of whom had come into contact with the first case) received Pertussis Vaccine as prophylaxis, and of this number only three developed whooping cough. Fourteen male patients who gave a history of not having the disease (nine of whom came into contact with the first case) received prophylaxis vaccine, and of these only three developed the disease.

All cases diagnosed as whooping cough received pertussis vaccine as a therapeutic measure. The epidemic was very light; there were no complications, and it is difficult to judge of the value of the use of whooping cough vaccine as a therapeutic measure. Five cases developing whooping cough gave a history of having had the disease previous to admission.

Owing to the long waiting list of adult type patients and the undesirability of using a portion of the ward for adult type cases as an infirmary for hilum type cases, it was thought advisable to use two class rooms at the schoolhouse for a receiving ward and infirmary for the hilum type cases.

This change enables us to admit a greater number of pulmonary cases. Unfortunately, however, there is still a long waiting list for the adult type cases, and undoubtedly it will be necessary to consider increased accommodations for the pulmonary cases in the near future.

There is a growing need for an infirmary for semi-ambulant closed cases of tuberculosis. The number of cases of this type is steadily increasing. It is undesirable to place them in the wards with the open cases, and although they are able to attend school, we do not consider it wise to have them reside on the pavilions with the hilum type cases who are physically active.

SPECIAL CLINICS.

Two eye clinics were held during the year by Doctor Odeneal of Beverly, forty-one patients were examined, and twenty-five were fitted with glasses.

Four ear, nose and throat clinics were held by Doctors Odeneal and DeWolf, and tonsils and adenoids were removed from eleven patients.

We believe that it will be necessary to hold more frequent clinics of this type in the future.

Doctor Cooper, and her associates, of the Department of Mental Diseases, have held Habit Clinics at the Sanatorium from time to time during the year. We have found the clinics to be most helpful in coming to a better understanding of certain types of patients. The number of clinics held was six. Number of children attending, twenty-one. Problems for which referred: retardation in school, thirteen; speech defect, four; behavior problems, fourteen; enuresis, one; soiling, two;

sex problems, two; poor school adjustment, two; neurotic ideas, one; hysteria, one; habit spasm, one. Number of defectives found, six.

Of all the patients admitted during the past year nineteen were previously examined in the Ten-year Program Clinic.

CLINICS.

No out-patient clinics were held during the scarlet fever epidemic. The following number of patients were examined in the out-patient and consultation clinics:

	Positive.	Negative.	Suspicious.	Totals.
Consultation Clinic	16	1	44	61
Out-Patient Clinic	76	409	6	491
Examination Clinic (Little Building)	—	2	60	62
Out-Patient X-Rays	—	—	—	539

In addition to the above, two hundred fifteen applicants for admission to the Happy Health Camp at Boxford were examined or X-Rayed; and seventeen were examined at Salem for admission to the camp at Salem Willows.

DENTAL REPORT.

The following table is a summary of the work done during the year:

Operative work. — Prophylactic Treatments, 556; Fillings (Perm. Teeth), 472; Fillings (Temp. Teeth), 123; Extractions (Perm. Teeth), 100; Extractions (Temp. Teeth), 645; Treatments, 930; Restorations, 16; X-Rays, 163; Irrigations, 368; Visits, 2,587; New Patients, 281; Dismissals, 559.

Dr. James H. Powers of Reading was appointed Permanent Dentist on April 1, 1929, to fill the vacancy caused by the resignation of Dr. Emanuel H. Kline.

LABORATORY REPORT.

The following examinations were made in our laboratory:

Sputum Examinations: Positive, 204; Negative, 763; Total, 967. Urine Analyses, 1,073; White Blood Counts, 96; Red Blood Counts, 11; Differential Counts, 33; Babcock Tests, 11; Throat Culture, 30; Other Smears, 52; Widal Tests, 174.

Report of Wassermann Tests. — Negative, 5.

During the year there has been expended \$219,395.87 for maintenance, a gross weekly per capita cost of \$20.02. There has been collected from miscellaneous sources \$56,313.41 (the total of all collections). Deducting this amount from the gross maintenance expenses, leaves a net expense of \$163,082.48. The net weekly per capita cost was \$14.88. There has been collected from private funds \$4,029.00, from cities and towns \$58,057.00. Twenty-six cases (including nine from Division of Child Guardianship) were supported by private funds, 308 by cities and towns, and 68 wholly by state.

MEDICAL REPORT.

There were 208 patients at the Sanatorium at the beginning of the year, and 211 at the close. The largest number present at any one time was 229, and the smallest number was 199. The daily average number of patients was 210.75. There were 202 cases admitted during the year, three less than last year.

There were 150 cases admitted from cities and towns of over 25,000 population, and 52 cases from cities and towns under 25,000 population. The average age of patients admitted was 10.05 years. Including deaths, there were 199 cases discharged, and the average duration of residence was 9.5 months. Of those discharged 178 gained 1,887 pounds, an average gain of 10.6 pounds per person.

Of the discharges there were 46 apparently well cases; 9 apparently cured; 55 arrested; 40 apparently arrested, one less than last year; 5 quiescent; 23 improved, 7 more than last year; 9 unimproved. There were 4 patients not considered, the duration of treatment being less than thirty days. There were 8 deaths, four more than last year.

There were 76,946 hospital days.

The following table shows the classification on the application blank and our classification on admission:

	Classification on Application Blanks.	Our Classification on Admission.
Hilum Tuberculosis	130	99
Minimal	27	9
Moderately Advanced	22	19
Advanced	6	8
Tuberculosis of Spine	—	4
Tuberculous Cervical Adenitis	1	1
Chronic Bronchitis	—	1
Chronic Cardiac Valvular Disease	—	1
Hypertrophied Tonsils	—	2
Malnutrition	—	26
No Disease	—	27
Unclassified	16	1
Deferred	—	4
	<hr/> 202	<hr/> 202

SANATORIUM SCHOOL.

Our teachers and pupils have worked under a great handicap the past year owing to the epidemics of scarlet fever and whooping cough, and the overcrowded conditions throughout the Sanatorium. At present only three class rooms are available for school work. We have been forced to discontinue the kindergarten class for the time being.

The work of Dr. Cooper in the Habit Clinic has demonstrated the need of a highly trained teacher to instruct those pupils found to be incapable of pursuing academic studies.

IMPROVEMENTS.

Work in the improvement of the Fire Protective System was completed during the year. Additional wells were driven. A new 100,000 gallon water tank was erected. A new cement lined underground main was put down. A chlorinating system was installed at the swimming pool. The carpenter shop was completed during the summer. The annex to the Administration Building and the East Cottage were re-shingled. A small fireproof building was erected for the storage of X-Ray films. An addition to the boiler room was made, the coal pocket covered, and a new 185 HP boiler installed, and numerous alterations made in the boiler room. Work was started on the new Isolation and Receiving Hospital in September.

RECOMMENDATIONS.

The two old 75 HP boilers should be replaced by two new 185 HP boilers, a new feed water heater and filter installed and numerous alterations made in the boiler and engine rooms this coming year. An employees' building to house from 45 to 50 employees should be erected, the Nurses' hall enlarged, and a small addition made to the patients' dining room.

The following improvements to the water supply and fire protective system should be considered this coming year:

Seven new 2½" tubular wells; reconstruction and fireproofing of pump house; installation of a new duplex double action plunger pump; platform and frost box for the present tower, on which is installed the 25,000 gallon tank.

Concrete slab top and manhole cover for pit at site of 25,000 gallon tank.

Extension of domestic service pipe line to Engineer and Steward's cottage and farm house.

Moving 20,000 gallon tank tower to new location and the erection of a 20,000 wood stave tank on tower.

Furnishing and erecting vacuum pump for the purpose of supplying steam for circulating water heater in 25,000 gallon fire service tank.

Fire service connection to yard main near Pavilion B East.

Installation of sprinkler heads in the Administration Building, Nurses' Hall and Chapel, Medical Building, Power House, East Ward, West Ward, Laboratory, East Cottage, Storehouse and Garage.

The hot and cold water lines in all buildings should be replaced, and the new hot water heater installed.

ACKNOWLEDGMENTS.

Our friends have been very generous to us this year. They have brought to us entertainment of various kinds, and have sent in many gifts such as books, magazines, toys, flowers and fruit.

To our clergymen, heads of the various departments and to each of their assistants, I wish to express my deep appreciation of their loyalty and co-operation.

Respectfully submitted,

CARL C. MACCORISON,
Superintendent.

POPULATION.

	Males.	Females.	Totals.
Number received during year	97	105	202
Number passing out of institution during year	110	89	199
Number at end of fiscal year in institution	88	123	211
Daily average attendance (number of inmates actually present during year)	99.37	111.38	210.75
Average number of employees and officers during year	49.50	57.29	106.79

INVENTORY.

Real Estate.

Land, 101.75 acres	\$4,901 30
Buildings	445,185 75
Betterments (additions and improvements)	117,505 67
Total, Real Estate	\$567,592 72

Personal Property — Undistributed Supplies.

Travel, Transportation and Office Expenses (total of Departmental Sheets)	\$414 62
Food (total of Departmental Sheets)	6,634 80
Clothing and Materials (total of Departmental Sheets)	2,728 83
Furnishings and Household Supplies (total of Departmental Sheets)	2,765 75
Medical and General Care (total of Departmental Sheets)	1,568 07
Heat, Light and Power (total of Departmental Sheets)	5,380 85
Farm (total of Departmental Sheets)	964 24
Garage, Stable and Grounds (total of Departmental Sheets)	154 52
Repairs (total of Departmental Sheets)	672 16
Total	\$21,283 84

Personal Property — Distributed Supplies.

Travel, Transportation and Office Expenses (total of Departmental Sheets)	\$3,768 20
Clothing and Materials (total of Departmental Sheets)	—
Furnishings and Household supplies (total of Departmental Sheets)	56,761 54
Medical and General Care (total of Departmental Sheets)	6,492 91
Heat, Light and Power (total of Departmental Sheets)	—
Farm (total of Departmental Sheets)	10,021 74
Garage, Stable and Grounds (total of Departmental Sheets)	5,846 32
Repairs (total of Departmental Sheets)	5,303 24
Total	\$88,193 95

Grand Summary.

Real Estate, Total	\$567,592 72
Personal Property — Undistributed Supplies, Total	\$21,283 84
Personal Property — Distributed Supplies, Total	88,193 95
	109,477 79
Grand Total	\$677,070 51

Statistical Tables.

TABLE I. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in Sanatorium Dec. 1, 1928	101	107	208
Patients admitted from Dec. 1, 1928, to Nov. 30, 1929, incl.	97	105	202
Patients discharged from Dec. 1, 1928, to Nov. 30, 1929, incl.	110	89	199
Patients remaining in Sanatorium Nov. 30, 1929	88	123	211
Daily average number of patients	99.37	111.38	210.75
Deaths (included in number discharged)	2	6	8

TABLE II. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	97	105	202
Total	97	105	202

TABLE III. — *Age of Patients Admitted.*

	Males.	Females.	Totals.	Per Cent.
1 to 6 years	28	16	44	21.78
7 to 13 years	54	60	114	56.44
14 to 18 years	15	29	44	21.78
Total	97	105	202	100.

Average age of patients, 10.05 years.

TABLE IV. — *Nativity and Parentage of Patients Admitted.*

PLACE OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patient.	Father.	Mother.	Patient.	Father.	Mother.	Patient.	Father.	Mother.
United States	89	54	47	94	37	37	183	92	84
Massachusetts	81	43	39	86	26	27	167	69	66
Other N. E. States	6	7	4	5	8	5	11	15	9
Other States	2	5	4	3	3	5	5	8	9
Totals	89	55	47	94	37	37	183	92	84
Other Countries:									
Albania	—	—	—	1	3	1	1	3	1
Argentina	—	—	—	—	—	1	—	—	1
Armenia	—	1	—	—	—	—	—	1	—
Azores	—	—	1	—	1	2	—	1	3
Belgium	—	—	—	—	1	1	—	1	1
Brazil	—	1	—	—	—	—	—	1	—
Canada	6	10	14	9	22	18	15	32	32
Cape Verde	—	—	—	—	1	1	—	1	1
Denmark	—	—	—	—	—	1	—	—	1
England	—	—	—	—	1	4	—	1	4
Finland	—	—	—	—	1	1	—	1	1
Greece	1	1	1	—	1	1	1	2	2
Ireland	—	5	9	—	13	12	—	18	21
Italy	1	11	12	1	10	8	2	21	20
Lithuania	—	1	1	—	1	1	—	2	2
Newfoundland	—	1	1	—	1	2	—	2	3
Norway	—	1	1	—	—	—	—	1	1
Poland	—	1	1	—	4	4	—	5	5
Portugal	—	—	—	—	2	1	—	2	1
Rumania	—	1	—	—	—	—	—	—	—
Russia	—	3	4	—	3	3	—	6	7
Scotland	—	4	3	—	1	3	—	5	6
Sweden	—	—	1	—	1	2	—	1	3
Syria	—	—	—	—	1	1	—	1	1
West Indies	—	1	1	—	—	—	—	1	1
Total Foreign	8	42	50	11	68	68	19	110	118
Grand Totals	97	97	97	105	105	105	202	202	202

TABLE V. — *Residence of Patients Admitted.*

Amesbury	7	Everett	2	Medford	3	Stoughton	1
Andover	1	Fall River	2	Melrose	4	Taunton	2
Arlington	1	Gloucester	1	Newburyport	4	Tewksbury	1
Ashland	1	Haverhill	1	Newton	1	Tyngsborough	1
Belmont	1	Hingham	1	Norfolk	1	Wakefield	2
Beverly	4	Ipswich	1	Peabody	1	Weymouth	1
Boston	55	Lawrence	4	Quincy	13	Waltham	1
Bridgewater	1	Lowell	2	Randolph	1	Wilmington	3
Brockton	1	Lynn	14	Reading	5	Winchester	1
Brookline	5	Malden	9	Revere	3	Worcester	1
Cambridge	18	Manchester	1	Salem	1	Wrentham	1
Canton	2	Marlborough	1	Somerville	8		
Chelsea	4	Maynard	1	Stoneham	1	Total	202

TABLE VI. — *Occupations of Patients Admitted.*

	Males.	Fe- males.	Totals.		Males.	Fe- males.	Totals.
Attendant Nurse	1	—	1	Waiter	1	—	1
Factory Worker	—	2	2	Pre-school children	16	7	23
Student	79	96	175	Total	97	105	202

TABLE VII. — *Stage of Disease on Admission.*

	Males.	Females.	Totals.	Percentage.
Hilum Tuberculosis	48	51	99	49.00
Minimal	4	5	9	4.46
Moderately Advanced	5	14	19	9.41
Advanced	1	7	8	3.96
Tuberculosis of Spine	1	3	4	1.99
Tuberculous Cervical Adenitis	—	1	1	.49
Chronic Bronchitis	—	1	1	.49
Chronic Cardiac Valvular Disease	—	1	1	.49
Hypertrophied Tonsils	2	—	2	.99
Malnutrition	16	10	26	12.87
No Disease	18	9	27	13.37
Unclassified	1	—	1	.49
Deferred	1	3	4	1.99
Totals	97	105	202	100.00

TABLE VIII. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Apparently Well	33	13	46	23.12
Apparently Cured	4	5	9	4.52
Arrested	33	22	55	27.64
Apparently Arrested	18	22	40	20.10
Quiescent	4	1	5	2.51
Improved	10	13	23	11.56
Unimproved	4	5	9	4.52
Died	2	6	8	4.02
Not Considered	2	2	4	2.01
Totals	110	89	199	100.00

TABLE IX. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	—	1	1	—	1	1
1 to 2 months	—	—	—	1	—	1
2 to 3 months	—	—	—	—	1	1
3 to 4 months	—	1	1	1	—	1
4 to 5 months	—	—	—	—	1	1
5 to 6 months	—	—	—	—	—	—
6 to 7 months	—	1	1	—	—	—
7 to 8 months	—	—	—	—	—	—
8 to 9 months	—	—	—	—	—	—
9 to 10 months	—	—	—	—	—	—
10 to 11 months	—	—	—	—	1	1
11 to 12 months	—	—	—	—	—	—
12 to 18 months	—	1	1	—	2	2
19 to 24 months	1	2	3	—	—	—
Over 2 years	1	—	1	—	—	—
Totals	2	6	8	2	6	8

TABLE X. — *Cause of Death.*

	Males.	Females.	Totals.
Tuberculosis of Lungs	2	5	7
Scarlet Fever	—	1	1
Totals	2	6	8

Financial Report, North Reading State Sanatorium, 1929.

To the Department of Public Health:

I respectfully submit the following report of the finances of this institution for the fiscal year ending November 30, 1929.

STATEMENT OF EARNINGS.

Board of Patients:			
Private	\$4,029 00		
Cities and Towns	58,057 00		
		\$62,086 00	
Personal Services:			
Labor of Employees			-
Reimbursement from Board of Retirement		65 70	
Sales:			
Travel, Transportation and Office Expense	-		
Food	\$14 00		
Clothing and Materials	671 05		
Furniture and Household Supplies	36 03		
Medical and General Care	206 65		
Heat, Light and Power	-		
Farm	71 37		
Garage, Stable and Grounds	63 30		
Repairs, Ordinary	-		
Repairs and Renewals	-		
Arts and Crafts Sales	-		
Sundry Sales from Storeroom	75 80		
		1,138 20	
Miscellaneous:			
Interest on Bank Balances	\$343 58		
Refunds, Account Previous Years	30 00		
Unclaimed Wages	57 29		
Board of Laborer	33 44		
		464 31	
Total Earnings for the Year			\$63,754 21
Total Cash Receipts Reverting and Transferred to the State Treasurer			\$56,313 41
Accounts Receivable Outstanding Dec. 1, 1928	\$11,899 11		
Accounts Receivable Outstanding Nov. 30, 1929	19,064 03		
		7,164 92	
Accounts Receivable Increased			\$63,478 33
Adjustment Made March 31, 1929			275 88
			\$63,754 21

MAINTENANCE APPROPRIATION.

Balance from previous year, brought forward		\$2,500 73
Appropriation, current year	\$211,000 00	
Supplemental Budget	14,200 00	
		225,200 00
Total		\$227,700 73
Expenditures as follows:		
Personal Services	\$123,729 68	
Food	45,130 94	
Medical and General Care	5,010 55	
Farm	3,899 59	
Heat, Light and Power	10,562 21	
Garage, Stable and Grounds	1,207 70	
Travel, Transportation and Office Exp.	2,256 84	
Religious Instruction	1,554 46	
Clothing and Materials	2,545 11	
Furnishings and Household Supplies	5,848 01	
Repairs Ordinary	3,801 17	
Repairs and Renewals	13,849 63	
Total Maintenance Expenditures		\$219,395 89
Balance of Maintenance Appropriation, Nov. 30, 1929		\$8,304 84
Estimated Outstanding Liabilities, Nov. 30, 1929		\$547 12

SPECIAL APPROPRIATIONS.

Balance Dec. 1, 1929, brought forward		\$9,527 01
Appropriations for current year		212,000 00
Total		\$221,527 01
Expended during year (see statement below)	\$82,193 92	
Reverting to Treasury of Commonwealth (star balances below that are reverting)	*14 64	
		82,208 56
Balance Nov. 30, 1929, carried to next year		\$139,318 45

APPROPRIATION.	Act or Resolve.	Total Amount Ap- propriated.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
*Service Bldg. Add. and Imp.	138, 1927	\$14,000 00	\$11 00	\$13,985 36	Has reverted.
Add. Fire Protection	127, 1928	9,000 00	8,867 29	8,990 05	\$9 95
Improving Sewer System	127, 1928	3,500 00	557 58	3,433 45	66 55
Admitting and Isolation Building	146, 1929	172,000 00	38,850 47	38,850 47	133,149 53
Power House Alterations	146, 1929	19,000 00	15,282 08	15,282 08	3,717 92
Imp. Water Supply and Fire Pro- tection	146, 1929	21,000 00	18,625 50	18,625 50	2,374 50
	—	\$238,500 00	\$82,193 92	\$99,166 91	\$139,318 45

PER CAPITA.

During the year the average number of patients has been	210.75
Total cost of maintenance	\$219,395 89
Equal to a weekly per capita cost of (52 weeks to year)	\$20 02
Total receipts for the year	\$56,313 41
Equal to a weekly per capita of	\$5 14
Total net cost of maintenance for year (total maintenance less total receipts)	\$163,082 48
Net weekly per capita	\$14 88

Respectfully submitted,

ETHEL M. KNIGHT,
Treasurer.

RUTLAND STATE SANATORIUM.

RESIDENT OFFICERS.

ERNEST B. EMERSON, M.D., *Superintendent.*
 PAUL DFAULT, M.D., *Assistant Superintendent.*
 ARMAND LAROCHE, M.D., *Senior Physician.*
 JACOB KAMINSKY, M.D., *Assistant Physician.*
 GABRIEL NADEAU, M.D., *Assistant Physician.*
 J. PHILIPPE PAQUETTE, M.D., *Assistant Physician.*
 DELYA E. NARDI, *Principal of the School of Nursing.*
 RENA BLANCHE NAUSS, *Assistant Principal of the School of Nursing.*
 MARY E. BELL, *Dietitian.*
 OLIN C. BLAISDELL, *Steward.*
 MARY A. BOYLE, *Treasurer.*
 HARRY U. WENDELL, *Chief Power and Plant Engineer.*
 JOSEPH A. CARROLL, *Head Farmer.*
 CORA A. PHILLIPS, *Head Housekeeper.*

NON-RESIDENT OFFICERS.

FRANK H. WASHBURN, M.D., *Consulting Surgeon.*
 EDWARD D. CHURCHILL, M.D., *Consulting Surgeon.*
 G. ARNOLD RICE, M.D., *Consulting Laryngologist.*

Report of the Superintendent.

To Dr. GEORGE H. BIGELOW, *Commissioner, Department of Public Health.*

I have the honor to submit the thirty-third annual report of the Rutland State Sanatorium for the year ending November 30, 1929.

During the year there has been expended \$323,319.49 for maintenance, a gross weekly per capita cost of \$17.22. There has been expended from Special Appropriations authorized by Chapter 127, Acts of 1928, Item 597, Additional Fire Protection, \$13,822.00; Item 596, Women Employees' Building, \$43,469.84; from Special Appropriations authorized by Chapter 146, Acts of 1929, Furnishings for Women Employees' Building, \$7,922.18; Water Supply and Sprinkler Heads, \$68.46.

There has been collected from miscellaneous sources, (the total of all collections) \$247,863.12, a decrease of 17.85 per cent under the collections of last year. Deducting this amount from the gross maintenance expense leaves a net expense of \$75,456.37, a net weekly per capita cost of \$4.02. There has been collected

from private sources \$17,026.00; from cities and towns \$44,773.00; from Worcester County, \$41,607.50; from Middlesex County, \$122,717.50; from the Tubercular Hospital District of Chelsea, Revere and Winthrop, \$19,162.50.

Fifty-six cases were supported wholly or in part from private funds; fifty-one cases by cities and towns; twenty-eight wholly by the State; one hundred and thirty-five by Middlesex County; fifty-eight by Worcester County; eighteen by the Tubercular Hospital District of Chelsea, Revere and Winthrop; and one by the Department of Public Welfare, Division of Child Guardianship. There were fifteen cases on which settlement had not been determined.

There were 364 patients in the sanatorium at the beginning of the year and 357 at the close. The largest number present at one time was 368 and the smallest 352. The daily average number of patients was 361.08, an increase of 1.46. There were 333 patients admitted during the year, 82 less than last year; 55 minimal, 136 moderately advanced, 131 far advanced, 9 unclassified and 2 hilum. There were 192 admitted from cities and towns of over 25,000 population and 141 from cities and towns under 25,000 population. The average age of patients admitted was 30.52, a decrease of 5.27. Including deaths there were 340 patients discharged, 64 less than last year. The average duration of residence was 346 days, 84 more than last year. Of those discharged 199 gained 2,384.50 pounds, an average gain of 11.98 pounds per person. Of the discharges there were 6 arrested cases, 4 less than last year; 13 apparently arrested cases, 1 more than last year; 124 quiescent cases, 33 less than last year; 50 improved, 69 unimproved and 10 not considered, the duration of treatment being less than one month. There were 8 discharged non-tuberculous. There were 60 deaths, 30 less than last year. There were 131,795 days of treatment, 171 more than last year.

The following table shows the classification on the application blank and our classification on admission:

	CLASSIFICATION ON APPLICATION BLANKS.		OUR CLASSIFICATION ON ADMISSION.		PER CENT.	
	1928.	1929.	1928.	1929.	1928.	1929.
Minimal	99	86	66	55	15.90	16.52
Moderately Advanced	241	182	131	136	31.57	40.84
Far Advanced	51	37	204	131	49.16	39.34
Unclassified	22	26	8	9	1.93	2.70
Hilum	2	2	5	2	1.20	.60
Non-tuberculous	—	—	1	—	.24	—
	415	333	415	333	—	—

Laboratory Report.—The following is a report of the work done in the laboratory during the year: Urine examinations: Routine, 467; 24 hour amount, 9; qualitative sugar determination and specific gravity, 1,060; qualitative sugar determination and specific gravity, 24 hour amounts, 107; Total, 1,643. Sputum examinations for the tubercle bacilli: Positive, 2,574; No tubercle bacilli found, 3,432; Total, 6,006. Special tests on urine specimens: quantitative sugar determination, 158; tests for acetone, 351; tests for diacetic acid, 351. Kidney function test, 1; Blood counts, 84; Blood cultures, 4; Blood coagulation time, 2; Blood examined for malarial parasites, 2; Test for occult blood, 2; Guinea pig inoculations and autopsies, 18. Differentiation of bacteria: by smears, 21; by cultures, 21. Microscopic examination of feces, 4. Microscopic examination of sputum for Curschmann spirals, etc., 2. Examination of pork for Trichinella Spiralis, 6. Examination of sputum by antiformin method, 2. Cultures for tubercle bacilli, special media and treatment of material (Corper and Uyer Method) from sputum, 10; from pleural fluid, 2. Cultures for further examination for Bacillus Typhosis: from urine, 90; from feces, 82; Widal reactions, 240. Chemical examination of blood for sugar (Folin's method), 87. Chemical examination of blood serum for calcium (Kramer and Tisdall's method), 22. Tests for determining Ultra Violet Ray intensity by acetone methylene blue gauge, 119. Blood drawn for Wassermann Test: negative 253, positive 18, doubtful 6, total 277. Spinal Fluid drawn for Wassermann test: Negative, one.

Of the total number of patients remaining in the sanatorium November 30, 1929, (357) 3.9% have reported no sputum, 76.5% have positive sputum and 19.6% tubercle bacilli not found. Of the total number of patients whose sputum was examined, 79.6% were positive.

There were 248 smallpox vaccinations; 286 Typhoid and Paratyphoid A and B; 1,074 X-ray plates of chest and 62 X-ray plates of teeth.

Lectures. — Twenty-four lectures in bacteriology were given to the Nurses' Training School.

Dentistry. — The following is a summary of the dental work done during the year: Office Visits, 1,837; Individual Visits, 1,051; Prophylaxis, 87; Fillings, 711; Extractions under Novocaine, 352; Post extractions, 171; Treatments, 1,072; Restorations, 40; X-rays, 62; Pyorrhœa cases treated, 62; Vincent's Disease, 9; Gingivitis cases treated, 52; Bed cases, 38; Plates repaired, 8; Plates trimmed, 71; Gangrene case treated, 1; Stomatitis cases treated, 20; Plates fitted, 55; Restorations fitted, 3; Bridges cemented, 3; Bridges removed, 10; Plates remade, 5; Plates given, 21; Mouth washes, 24; Bites for plates, 32; Gold Crowns given, 4; Gold inlays, 23; Steel Face, 1; Clasp band tightened, 1; Gold Clasp, 1; Processes removed from molar regions, 2; Surgical Removals, 2; Nerve Removal, 1; Upper Plate adjusted, 2; Impacted molars extracted, 4; Impacted molars treated, 2; Root Canal filled, 1; Abscess treatment, 1; Upper plate tightened, 1; Abscesses lanced, 2; Davis Crown cemented, 1.

CLINICS.

The following tables indicate the work of the consultation service, clinics, out-patients and others:

Consultation Clinics. — Number of patients examined at the Worcester, Gardner, Framingham and Clinton Clinics, 235. Diagnosis: Tuberculosis, 50; Non-tuberculous, 55; Observation, 70; Hilum, 16. There were 44 cases examined on which a diagnosis of tuberculosis had previously been made.

Two hundred and thirty-five consultation cases reported for 235 examinations, and 31 ex-patients reported for 42 follow-up examinations, making a total of 277 examinations at the consultation clinics.

Number of patients examined once, 179; twice, 18; three times, 5; five times, 1.

Number of ex-patients examined once, 23; twice, 7; six times, 1.

Number of physicians referring patients, 76.

There were 15 patients admitted to the sanatorium following examinations at the consultation clinics.

Sanatorium — Out-patient Clinic. — Patients referred by physicians, 156; patients examined at own request, 58; Total, 214.

Ex-patients examined at own request, 118; Total, 332.

Diagnosis: Tuberculosis, 95; Non-tuberculous, 69; Observation, 36; Hilum, 8; Total, 208.

Two hundred and eight patients reported for 220 examinations and 128 ex-patients reported for 179 examinations, making a total of 399 examinations at the sanatorium.

Number of patients examined once, 185; twice, 11; three times, 3; four times, 1.

Number of ex-patients examined once, 87; twice, 32; three times, 8; four times, 1.

Number of physicians referring patients to the sanatorium, 111.

There were 22 patients admitted to the sanatorium following examinations at the sanatorium.

The total of all examinations made during the year, exclusive of routine work, was 676.

PERSONNEL.

Dr. William B. Davidson, Assistant Superintendent, resigned August 31, 1929, and has opened an office in Worcester to practice his specialty. Doctor Davidson rendered conscientious and efficient service to the sanatorium for ten years, developing particularly the X-Ray department. His resignation adds another

to an already long list of resignations which make a break in any progress there may be toward better medical work. His resignation is not only a loss to the sanatorium, but a personal loss to me of a conscientious and loyal co-worker.

Dr. Paul Dufault, Senior Physician, was promoted to the position of assistant superintendent.

Dr. Armand Laroche, Assistant Physician, was promoted to the position of senior physician.

Dr. J. Philippe Paquette was appointed assistant physician October 1, 1929.

MEDICAL REPORT.

Doctor Kaminsky is making a study of the general effects of irradiated ergosterol in pulmonary tuberculosis in conjunction with studies of calcium metabolism. A preliminary report is ready for publication.

Doctor Dufault is making a study of artificial pneumothorax pressures by kymographic tracings.

Twenty cases of intestinal tuberculosis in either advanced or terminal stages of pulmonary tuberculosis have been treated with cod liver oil and tomato juice in accordance with McConkey's Method. The oil has been given after meals in doses from one dram to one-half ounce floated in three ounces of tomato juice thoroughly chilled. While this treatment is not a specific, it appears to be a valuable adjunct to other measures in the treatment of this distressing complication. In thirteen cases there has been amelioration or the complete disappearance of the following symptoms: pain, diarrhoea and indigestion. In four of this group there was an improvement in the appetite and a gain in weight. There were seven who showed no improvement: four of these were unable to continue the treatment because of digestive disturbances; the other three, still under treatment, show as yet little change.

For years little that is new and of practical value, which has stood the test of time, has been mentioned in sanatorium reports save variations in the three old standbys — rest, fresh air and good food, or in other words correcting and improving habits of living, and at a later date treating complications: defective teeth, tonsils, adenoids, and abdominal conditions to say nothing of the more obscure mental states oftentimes unrecognized, nevertheless serious complicating factors.

The treatment of tuberculosis is not the treatment of that disease alone but of whatever complicating conditions, either medical or surgical, may be present. No longer may the sanatorium function under the traditions of the past: prescribing rest, fresh air, milk and eggs alone, it must bring about the rehabilitation of the patient, not only the arrest if possible of his tuberculosis but the alleviation of his other ailments; and the failure to correct the complication may mark the difference between the arrest of his disease and a life of invalidism. The numerous complaints of patients are not all imaginary; if investigated they not infrequently lead to conditions that are invaliding the patient as much or more than his tuberculosis.

The problem is far broader than the routine treatment of a ready-made diagnosis and complacently ignoring the possibilities. It is a problem for the internist, the surgeon, the laryngologist, the roentgenologist, the dentist, the laboratorian, the social worker, and to complete the team the psychiatrist. The questions involved are not so far removed from those of the general hospital.

Bearing in mind the foregoing, the admission of Mr. X. should be regarded as an unknown; he may have tuberculosis, he may have something else: the sanatorium should have the personnel and the equipment to solve and to correct the disabilities of Mr. X.

Mechanical means or measures of treating tuberculosis have been in use for many years, particularly artificial pneumothorax, the use of which is becoming more and more universal inasmuch as many cases previously thought unsuitable for this treatment are now known to respond favorably.

During the past year 117 pneumothorax cases received 1,704 treatments. There are at the present time 89 cases in the sanatorium receiving this treatment. An average of 33 treatments are given each week.

More recently the field of thoracic surgery has been entered by the American Surgeon and something new is offered where medical treatment has hitherto failed. Phrenicectomy, cutting of pleural adhesions and thoracoplasty have come to the front as valuable measures for the relief of the disease. Thoracoplasty, the more radical operation, affords the more striking results in those cases where sanatorium treatment has failed or has little or nothing to offer for the future. Alexander has tabulated the results of 1,159 thoracoplasties reported during 1918-1925. Bearing in mind there is no standard system of classification of thoracoplasty results, and the fallacies of statistics, the operative results in this group are as follows: cured 36.8%, improved 24.4%, worse 5.25%, dead from causes not connected with the operation 33.5%. It is a difficult matter to determine when a patient is cured in the sense that the word is generally used, certainly not until the lapse of several years of absence of all symptoms. I suspect some of these cases might more accurately be classified as arrested, even so, the results appear to justify the surgical risk. During the past two years thoracoplasty has been done on ten cases, and altho the number is too small and the time since operation too short to draw any conclusions as to the ultimate results, we feel that the relief of symptoms and the general improvement noted are an index of further improvement or permanent relief. The ten cases operated upon had in the opinion of the Staff either derived all the benefit that might be expected from medical treatment or were definitely retrograding. The results of operation are as follows: apparently arrested 2, quiescent 3, improved 4, dead 1. In the case which died the operation was not completed on account of the patient's condition yet there was temporary relief for a few weeks before the end. Phrenicectomy has been done on 16 cases either as an adjunct to thoracoplasty or as a palliative measure alone.

Aside from the cases of thoracic surgery, there has been during the past five years or more an increase in the number of surgical complications requiring treatment which could not be given in the sanatorium for the lack of suitable facilities. During the past year there were 84 surgical cases. The transfer of these patients to other hospitals entails hardship always and not infrequently a considerable hazard. A medical building with an operating room, nose and throat room, X-Ray laboratory, examination rooms, and dental laboratory is a necessity if we are to meet the problems of diagnosis and treatment of the day.

RECOMMENDATIONS.

In view of the foregoing outline of medical and surgical work in the sanatorium, I recommend an appropriation of \$35,000.00 for the erection of a medical and surgical building and the remodelling of Ward N to a surgical ward.

Domestic and Fire Service to Farm Buildings.

I would recommend an appropriation of \$4,500.00 for this service in accordance with the plans submitted by the Division of Engineering.

Hay, Barn, Garage and Equipment.

To replace the building and equipment destroyed by fire, I would recommend an appropriation of \$22,700.00 to be applied in accordance with the following estimates: hay barn \$14,000.00; garage and blacksmith shop \$1,800.00; tools and implements \$6,900.00.

Lightning Protection.

Lightning has struck three times this year in sight of the Administration Building. Two years ago it struck one of the wards and on August 23rd of the current year it struck the horse barn, destroying that building, wagons, shed and practically all of the farming implements. I believe lightning is a real hazard and that we should have whatever protection lightning rods may afford. I would therefore recommend an appropriation of \$6,600.00 for the installation of lightning rods.

IMPROVEMENTS.

The following projects have been completed or are under way: the Women Employees' Building authorized under Chapter 127, Item 596, Acts of 1928,

was completed and ready for occupancy August 1, 1929. From the balance of the appropriation \$8,000.00 was authorized for the purchase of furnishings.

Under additional fire protection, Chapter 127, Item 597, Acts of 1928, a 100,000 gallon storage tank and a Knowles Pump, etc., have been installed at a cost of \$13,822.00. The further installation of sprinkler heads is under way at the present time.

TRAINING SCHOOL.

The training school for nurses is now in its twenty-second year, and it is not out of place to mention again the value of its training for both men and women, particularly those who have had tuberculosis and are in a measure handicapped. The demand for trained nurses in sanatoria far exceeds the supply. The following affiliations supplement the course given at the sanatorium: Cooley-Dickinson Hospital, obstetrics and surgery, Worcester City Hospital, pediatrics and medicine and Worcester State Hospital, mental diseases. There are 35 pupil nurses: 13 seniors, 11 intermediates, 4 juniors and 7 preliminaries.

The following have been awarded diplomas:

Alice Wennerstrom.
Tekla Wolack.
Martha McGivney.

Edna Melanson.
Marjorie Durling.
Vivian Soper.

Instruction in the training school has been given by the Staff and by a course of lectures given by Dr. Joseph Muller.

RELIGION.

Reverend Mr. French, Reverend Father McNamara, Reverend Father Smith, have served another year bringing consolation and cheer to all.

ACKNOWLEDGMENTS.

I wish to acknowledge with gratitude the ten years of friendship, cooperation and service of Rabbi H. S. Bloom who resigned early in the year because of illness.

Rabbi A. D. Zeldner was appointed to fill the vacancy.

I am grateful to the employees who have contributed so faithfully and loyally, not only in doing the tasks of the day, but for that human touch which cannot be measured.

Again I am deeply appreciative of your continued consideration and counsel.

Respectfully,

ERNEST B. EMERSON,
Superintendent.

VALUATION.

Land.

Grounds, 47.797 acres	\$17,414 30
Lawns and buildings, 37.797 acres.	
Roads, 10.00 acres.	
Woodland, 68.00 acres	2,516 00
Mowing, 68.68 acres	6,879 00
Tillage, 42.45 acres	4,117 50
Tillage, 37.93 acres.	
Garden, 4.52 acres.	
Orchard, 6.10 acres	1,220 00
Pasture, 77.56 acres	2,935 65
Waste and Miscellaneous, 54.14 acres	2,210 95
Rough Pasture, 27.49 acres.	
Meadow Swamp, 20.17 acres.	
Sewer Beds, 5.98 acres.	
Coal Trestle, .50 acre.	
Sewerage System	16,277 06
	<hr/>
	\$53,570 46

Buildings.

Institution Buildings	\$586,864 58
Farm, Stable and Grounds	24,625 00
Miscellaneous	107,535 38
	<hr/>
	719,024 96
	<hr/>
	\$772,595 42
Present value of all personal property as per inventory of November 30, 1929	102,969 00
	<hr/>
Grand Total	\$875,564 42

POPULATION.

	Males.	Females.	Totals.
Number received during the year	191	142	333
Number passing out of the institution during the year	190	150	340
Number at the end of fiscal year in the institution	186	171	357
Daily average attendance (number of inmates actually present during the year)	184.99	176.09	361.08
Average number of employees and officers during the year	123.68	72.15	195.83

EXPENDITURES.

Current expenditures:			
1. Personal Services	\$164,882	53	
2. Clothing	162	68	
3. Subsistence	73,404	12	
4. Ordinary repairs	6,330	82	
5. Office, domestic and outdoor expenses	70,222	45	
			\$315,002 60
Extraordinary expenses:			
1. Permanent improvements to existing buildings			8,316 89
			\$323,319 49

Summary of Current Expenses.

Total expenditures	\$323,319	49	
Deducting extraordinary expenses	8,316	89	
			\$315,002 60
Deducting amount of sales			1,834 14
			\$313,168 46

Dividing this amount by the daily average number of patients, 361.08, gives a total cost for the year of \$867.31, equivalent to an average weekly net cost of \$16.68.

Financial Report, Rutland State Sanatorium, 1929.*To the Department of Public Health.*

I respectfully submit the following report of the finances of this institution for the fiscal year ending November 30, 1929:

STATEMENT OF EARNINGS.

Board of patients:			
Private	\$16,673	00	
Cities and Towns	45,080	00	
Middlesex County	122,717	50	
Worcester County	41,607	50	
Chelsea, Revere and Winthrop	19,162	50	
State Minor Wards	46	00	
			\$245,286 50
Personal Services:			
Reimbursement from Board of Retirement			142 83
Sales:			
Travel, Transportation and Office Expense	\$10	00	
Food	662	77	
Clothing and Materials	—	—	
Furniture and Household Supplies	—	—	
Medical and General Care	370	65	
Heat, Light and Power	65	86	
Farm	544	85	
Garage, Stable and Grounds	178	51	
Repairs, Ordinary	1	50	
Repairs and Renewals	—	—	
Arts and Crafts Sales	—	—	
			1,834 14
Miscellaneous:			
Interest on bank balances	\$599	65	
Wages Unclaimed	24	34	
Refunds, Previous Year	200	08	
			824 07
Total Earnings for the year			\$248,087 54
Total cash receipts reverting and transferred to the State Treasurer			\$248,087 54
Accounts Receivable outstanding Dec. 1, 1928	\$99,191	69	
Accounts Receivable outstanding Nov. 30, 1929	123,588	51	
			\$24,396 82
Accounts Receivable increased			

MAINTENANCE APPROPRIATION.

Balance from previous year, brought forward						\$8,057 83
Appropriation, current year					\$323,900 00	
Additional appropriation					2,700 00	
						326,600 00
Total						\$334,657 83
Expenditures as follows:						
Personal Services					\$164,882 53	
Food					73,404 12	
Medical and General Care					12,041 81	
Farm					16,776 38	
Heat, Light and Power					20,117 57	
Garage, Stable and Grounds					2,405 91	
Travel, Transportation and Office Expenses					3,796 51	
Religious Instruction					1,900 00	
Clothing and Materials					162 68	
Furnishings and Household Supplies					13,184 27	
Repairs Ordinary					6,330 82	
Repairs and Renewals					8,316 89	
Total Maintenance Expenditures						\$323,319 49
Balance of Maintenance Appropriation, Nov. 30, 1929						\$11,338 34
Estimated outstanding liabilities, Nov. 30, 1929						\$3,107 91

SPECIAL APPROPRIATIONS.

Balance December 1, 1928, brought forward						\$70,728 36
Appropriations for current year						15,000 00
						\$85,728 36
Total						
Expended during the year (see statement below)					\$65,282 48	
Reverting to Treasury of the Commonwealth						65,282 48
Balance November 30, 1929, carried to next year						\$20,445 88

APPROPRIATION.	Act or Resolve.	Total Amount Ap- propriated.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
Add. Fire Protection	Chap. 127, Acts 1928.	\$15,000 00	\$13,822 00	\$14,035 82	\$964 18
Women Employees' Bldg.	Chap. 127, Acts 1928.	66,000 00	43,469 84	61,527 66	4,472 34
Furnishings, Women Employees' Bldg.	Chap. 146, Acts 1929.	8,000 00	7,922 18	7,922 18	77 82
Water Supply and Sprinkler Heads	Chap. 146, Acts 1929.	15,000 00	68 46	68 46	14,931 54
		\$104,000 00	\$65,282 48	\$83,554 12	\$20,445 88

PER CAPITA.

During the year the average number of patients has been						361.08
Total cost of maintenance						\$323,319 49
Equal to a weekly per capita cost of (52 weeks to year)						\$17 22
Total receipts for the year						\$247,863 12
Equal to a weekly per capita of						\$13 20
Total net cost of maintenance for year (total maintenance less total receipts)						\$75,456 37
Net weekly per capita						\$4 02

Respectfully submitted,

MARY A. BOYLE,
Treasurer.

Statistical Tables.

TABLE 1. — Admissions and Discharges.

	Males.	Females.	Totals.
Patients in sanatorium Nov. 30, 1928	185	179	364
Patients admitted Dec. 1, 1928, to Nov. 30, 1929, inclusive	191	142	333
Patients discharged Dec. 1, 1928, to Nov. 30, 1929, inclusive	190	150	340
Patients remaining in sanatorium Nov. 30, 1929	186	171	357
Daily average number of patients	184.99	176.09	361.08
Deaths (included in number discharged)	31	29	60

TABLE 2. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	91	69	160
Married	89	70	159
Widowed	7	2	9
Divorced	4	1	5
	191	142	333

TABLE 3. — *Ages of Patients Admitted.*

	Males.	Females.	Totals.	Percentage.
14 to 20 years	22	13	35	10.51
20 to 30 years	74	83	157	47.14
30 to 40 years	37	35	72	21.62
40 to 50 years	36	7	43	12.92
Over 50 years	22	4	26	7.81
Average age	32.61	27.84	30.52	—

TABLE 4. — *Nativity and Parentage of Patients Admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	107	33	35	93	34	31	200	67	66
Other New England States	12	14	16	7	7	6	19	21	22
Other States	5	5	4	5	6	8	10	11	12
Total Native	124	52	55	105	47	45	229	99	100
Other Countries (24):									
Total Foreign	67	138	136	37	94	96	104	232	232
Unknown	—	1	—	—	1	1	—	2	1
Grand Totals	191	191	191	142	142	142	333	333	333

TABLE 5. — *Residence of Patients Admitted.*

Aldenville, 1	Hubbardston, 1	Somerville, 15
Amesbury, 1	Hudson, 3	Southbridge, 7
Arlington, 2	Leominster, 2	Spencer, 1
Ashburnham, 1	Lexington, 4	Springfield, 25
Ashland, 3	Lowell, 2	Stoneham, 1
Athol, 2	Malden, 6	Templeton, 1
Auburn, 1	Marlborough, 6	Townsend, 1
Barre, 3	Maynard, 3	Turners Falls, 1
Belmont, 1	Medfield, 1	Uxbridge, 2
Boston, 54	Medford, 11	Wakefield, 4
Boylston, 1	Melrose, 2	Waltham, 9
Braintree, 1	Mendon, 1	Ware, 1
Cambridge, 4	Milford, 3	Watertown, 7
Chelsea, 5	Natick, 5	Wayland, 1
Chicopee, 6	Needham, 1	Webster, 13
Clinton, 3	Newton, 5	Wellesley, 1
Concord, 1	North Adams, 2	Westfield, 1
Deerfield, 2	Northbridge, 2	Westminster, 1
Everett, 10	Northborough, 2	Weymouth, 1
Fall River, 2	Oakham, 1	Whitinsville, 2
Framingham, 5	Princeton, 1	Wilmington, 1
Gardner, 5	Quinapoxet, 1	Winchester, 1
Grafton, 3	Quincy, 1	Winthrop, 3
Greenfield, 1	Reading, 1	Woburn, 2
Holyoke, 6	Revere, 6	Worcester, 28
Hopkinton, 1	Rutland, 5	Total, 333

TABLE 6. — *Occupation of Cases Admitted.*

	Males.	Females.		Males.	Females.
Adjuster (Claim)	1	—	Laundress	—	1
Agent (Adv.)	2	—	Longshoreman	1	—
Agent (Ins.)	1	—	Machinist	2	—
Agent (Station)	1	—	Manager	1	—
Attendant	6	4	Manager (Textile)	1	—
Bacteriologist	1	—	Manager (Traffic)	2	—
Baggage Master	1	—	Mechanic	4	—
Barber	1	—	Merchant	1	—
Blacksmith	1	—	Millhand	1	1
Bookkeeper	2	3	Musician	1	—
Butcher	1	—	No Occupation	2	4
Buyer (Ass't.)	1	—	Nurse (Graduate)	—	6
Cabinet Maker	1	—	Nurse (Practical)	—	1
Carpenter	3	—	Nurse (Student)	—	4
Cashier	—	2	Operator (Crane)	1	—
Chauffeur	6	—	Operator (Elevator)	1	1
Chemist	1	—	Operator (Telephone)	—	4
Clerk	11	7	Packer	—	2
Collector	2	—	Painter	4	—
Compositor	1	—	Plumber	1	—
Contractor	2	—	Policeman	1	—
Counterman	1	—	Porter	1	—
Dental Assistant	—	1	Postmaster	1	—
Dentist	1	—	Pressman	1	—
Dressmaker	—	1	Printer	2	—
Dyer	1	—	Repairman	1	—
Electrician	1	—	Ropemaker's Helper	1	—
Engineer (Marine)	1	—	Saleslady	—	2
Errand Boy	1	—	Salesman	13	—
Factory	21	16	Secretary	2	—
Farmer	2	—	Skipper	1	—
Farmhand	1	—	Spinner (Metal)	1	—
Fireman	1	—	Steamfitter	1	—
Florist	2	—	Stenographer	—	4
Foreman	1	—	Student	10	3
Gardener	3	—	Supervisor	1	—
Gas Fitter	1	—	Surgeon (Tree)	1	—
Gas Welder	1	—	Surveyor	1	—
General Work	12	2	Tailor	2	—
Gold Beater	1	—	Tailoress	—	1
Hairdresser	—	2	Teacher	—	2
Housewife	—	59	Teller	1	—
Housework	—	5	Typist	—	1
Iceman	1	—	Upholsterer	1	—
Inspector (R.R.)	1	—	Waiter	2	—
Installer (Tel.)	1	—	Waitress	—	2
Instructor	1	1	Watchmaker	1	—
Janitor	2	—	Weaver	3	—
Laboratory Assistant	1	—	Window Trimmer	1	—
Laborer	12	—	Wood Carver	1	—

Total number of occupations, 100; Total number of males, 191; Total number of females, 142; Total, 333.

TABLE 7. — *Stage of Disease at Admission.*

	Males.	Females.	Totals.	Percentage.
Minimal	25	30	55	16.52
Moderately Advanced	80	56	136	40.84
Far Advanced	77	54	131	39.34
Unclassified	7	2	9	2.70
Hilum	2	—	2	.60
	191	142	333	—

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Arrested	3	3	6	1.77
Apparently Arrested	8	5	13	3.83
Quiescent	68	56	124	36.47
Improved	23	27	50	14.70
Unimproved	44	25	69	20.29
Deaths	31	29	60	17.65
Non-tuberculous	5	3	8	2.35
Not Considered	8	2	10	2.94
	190	150	340	—

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	—	—	—	2	1	3
1 to 2 months	—	1	1	—	—	—
2 to 3 months	—	—	—	1	1	2
3 to 4 months	1	—	1	4	—	4
4 to 5 months	1	—	1	1	1	2
5 to 6 months	1	1	2	2	1	3
6 to 7 months	1	—	1	—	5	5
7 to 8 months	—	—	—	1	2	3
8 to 9 months	—	—	—	1	1	2
9 to 10 months	1	—	1	—	3	3
10 to 12 months	—	—	—	3	2	5
12 to 18 months	6	6	12	7	6	13
18 to 24 months	3	6	9	3	2	5
Over 2 years	17	15	32	6	4	10
	31	29	60	31	29	60

TABLE 10. — *Cause of Death.*

	Males.	Females.	Totals.
Pulmonary Tuberculosis	30	29	59
Chronic Myocarditis	1	—	1
	31	29	60

WESTFIELD STATE SANATORIUM.

RESIDENT OFFICERS.

ROY MORGAN, M.D., *Superintendent.*
HEMAN B. CHASE, M.D., *Assistant Superintendent.*
ERNEST LANDRY, M.D., *Assistant Physician.*
GEORGE E. CROWELL, D.M.D., *Dentist.*
BESSIE MACDONALD, *Supt. of Nurses and Matron.*
JOSEPHINE E. FRENCH, *Treasurer.*
JOHN E. KINSELLA, *Steward.*
BENJAMIN J. SANDIFORD, *Chief Engineer.*
WILLIAM G. ATKINSON, *Farmer.*

NON-RESIDENT OFFICER.

M. ARCHIBALD DECHTER, M.D., *Consultant in Diseases of the Eye, Ear and Throat.*

Report of the Superintendent.

To GEORGE H. BIGELOW, M.D., *Commissioner, Department of Public Health.*

I have the honor to submit the twentieth annual report of the Westfield State Sanatorium for the year ending November 30th, 1929.

We had 296 patients at the beginning of the year and 289 at the close. Our daily average was 287.12. The largest number present was 303, the smallest 254. Total of cases admitted 279. These were classified as shown in the following table:

No Disease	11	Keratitis	1
Malnutrition	37	Scoliosis	1
Adenitis	1	Bronchopneumonia	1
Hilum Tuberculosis	146	Tuberculous Empyema	1
Minimal	22	Pneumonia Convalescent	1
Moderately Advanced	14	Pott's Disease	1
Advanced	26	Osteomyelitis	1
Pulmonary Abscess	1	Unclassified	2
Bronchiectasis	4		
Pleurisy with Effusion	8		
			279

POPULATION.

	Males.	Females.	Totals.
Number received during the year	136	143	279
Number passing out of the Institution during the year	130	156	286
Number at end of the fiscal year in the Institution	150	139	289
Daily average attendance (number of inmates actually present during the year)	146.54	140.58	287.12
Average number of employees and officers during the year	85	49	134

One hundred and eighty-three cases were admitted from cities and towns of over 25,000 population; 96 from cities and towns of less than 25,000. The average age of patients was 11.26 years. There were 286 discharges. The average length of stay of patients discharged, including deaths, was 345 days. Of these 47 were apparently well; 141 apparently arrested; 51 improved; 14 unimproved; 7 were not considered as they stayed less than 30 days. There were 26 deaths. Of those discharged 248 gained 3027.8 pounds, or an average of 12.2 pounds. There were 104,800 hospital days of treatment.

COMMENT.

The following is of interest in connection with our table of classifications. It is noted that 11 were classified as "No Disease" and 37 as Malnutrition. That is, 48 out of 279 admissions, or 1 in 6, were non-tuberculous. The worst feature of this is the fact that these cases could have been very easily proved non-tuberculous before admission by the simple expedient of the skin test. The medical profession generally does not seem to realize the difficulty of diagnosis in Hilum Tuberculosis or the importance of the skin test. It would be well if these points could be stressed in our educational campaign.

MEDICAL WORK.

Our medical work varies between two extremes. On one hand we have a large number of cases of Hilum Tuberculosis. These are almost uniformly favorable and require no particular treatment other than a well ordered system of hygienic living. On the other hand, we have a considerable number of cases of Pulmonary Tuberculosis in adolescent children. In these, up to the past two or three years, our results have been almost always unfavorable. Two or three years ago we began to give such cases longer periods of bed treatment. This policy has been closely followed during the past year and is apparently giving results. We now have a fair number of cases where even massive involvement has disappeared to a surprising extent, and these cases now seem to be on the way to recovery. It is too early to judge the final results in these cases but it would appear that this prolonged bed treatment is a decided advance in their treatment.

Our out-patient work again shows a healthy increase. The number of these cases for the past six years is as follows:

1924	241
1925	396
1926	441
1927	743
1928	1,077
1929	1,341

Practically all these cases have been referred by physicians or Boards of Health and have come from all parts of the western section of the state. We consider this a very important part of our work because in this clinic we discover a considerable number of early cases. This work is being carried on under great difficulties on account of our poor facilities. We have but one room, which must be used as X-Ray room, examining room and dressing room. This condition should be corrected as soon as possible.

As usual, we have cooperated with the Hampden County Tuberculosis Association in conducting clinics in this county. We have also furnished medical supervision for their summer camp and have given skin tests to all their children, X-Raying and examining all who reacted.

We have also done a great part of the medical work of the Franklin County Association and have a few times assisted Dr. O'Brien in his clinics in Hampshire County.

Our Consultation Clinics have been gradually reduced and during the past year have been discontinued entirely. We have done this because we want to encourage patients to come to the sanatorium, where they can be X-Rayed.

Our "outside" work for the year is summarized in the following table:

	Positive.	Negative.	Sus- picious.	Re-exami- nation.	Total.
1. Consultation Clinics	2	14	12	8	36
2. Examination Clinics	28	1,304	36	103	1,471
3. Out-Patient Clinics	182	648	119	392	1,341
	<u>212</u>	<u>1,966</u>	<u>167</u>	<u>503</u>	<u>2,848</u>

This shows that 212 new cases of tuberculosis were diagnosed in these clinics, or 7.4% of the total number examined.

Out-patient X-Rays 1,433

I have given two talks on Childhood Tuberculosis during the year; one before the Reciprocity Club of Holyoke, the other before the Westfield Medical Society.

DENTAL REPORT.

The following table shows the work done in the dental clinic during the year: Prophylactic Treatments, 839; Fillings, Permanent Teeth, 953; Temporary Teeth, 394; Extractions, Permanent Teeth, 142; Temporary Teeth, 175; Treatments, 1,286; Restorations, 30; X-Rays, 115; Irrigations, 39; Mouth Smears, 304; Surgical Treatments, 6; Total number of operations for the year, 4,283; Visits, 2,825; New Patients, 167; Dismissals, 819.

SANATORIUM SCHOOL.

Average Daily Attendance December, 1928, to December, 1929.

Grade I	22.96
Grade II	17.50
Grade III	16.99
Grade IV	17.95
Grade V	18.64
Grade VI	22.81
Grade VII	19.28
Grade VIII	17.75
Manual Training	21.60
Total Average	<u>175.48</u>
Total Enrollment	383

IMPROVEMENTS MADE DURING THE YEAR.

The swimming pool was completed last Fall, so was used for the first time this summer. I consider this the best investment we have ever made. This improvement has brought an increase in morale which would be almost unbelievable by anyone not accustomed to handling children. Sanatorium treatment, at its best, is prolonged and irksome especially to children. Anything which tends to keep up their morale is a paying proposition. Along this line we have installed radio sets in two of the wards and have plans under way for covering two other wards with radio service. We have also cleared an excellent slide near the water tank for coasting. This has already been used to some extent and bids fair to be as much a success as the swimming pool has been.

We have installed sprinklers in several buildings during the year and also have erected a new tank and put in a considerable amount of pipe for fire protection. We have also installed a new 75 kilowatt generator.

Outside of the projects named, our improvements have been of a minor nature.

RECOMMENDATIONS.

We are badly in need of additional quarters for employees. All available space has been utilized and we have a large number of employees living outside the institution.

Our facilities for X-Ray and Out-Patient work are entirely inadequate. We have a single room in which to carry on the X-Ray work of a 300-bed hospital and an Out-Patient Service covering 1,300 cases per year.

Our rooms for isolation are too small. This is a very important matter and should be corrected.

Certain additional work is also needed for fire protection.

All of these projects have been covered in our 1930 budget.

We should have a better place for skating. However, no specific recommendations on this project can be made at present as we have not yet worked out a feasible plan.

CHANGES.

We were very unfortunate during the year in losing Dr. Chadwick. After twenty years as Superintendent, he resigned on June 1 to take up the position of Director of Tuberculosis with the Detroit Department of Health. His loss has been deeply felt by everyone. He left an unusually good organization which I have been fortunate enough to retain. This has made my work much lighter. His going, however, has left a vacancy in the medical staff which has not been filled so far, excepting for about ten weeks when Dr. Boyle was with us. This has thrown a vast amount of work on my assistants, Dr. Chase and Dr. Landry. They have responded in most gratifying fashion. I wish to commend them to you for their efficient work under trying conditions.

Mrs. Morgan retired as Superintendent of Nurses in October, being replaced by Miss Bessie Macdonald. Miss Macdonald has been in charge of our Children's Ward for several years and is unusually well equipped for her new position.

There have been no other important changes in personnel during the year.

ACKNOWLEDGMENTS.

The Catholic, Protestant and Jewish Clergymen have continued their efficient work of previous years and we are greatly indebted to them.

We wish also to thank our friends in this vicinity who have given entertainments, provided gifts, and in other ways contributed to the pleasure of our children.

I would also extend my thanks to the members of this Department, and other State Departments with which we deal, for their efficient cooperation which has made our work much easier.

Respectfully submitted,

ROY MORGAN,
Superintendent.

VALUATION.

Land.

Grounds:		
Lawns and Buildings, 26.8 acres	\$5,235 00	
Woodland, 95.6 acres	4,664 00	
Mowing, 35.6 acres	2,670 00	
Tillage, 30.5 acres	2,187 50	
Orchard, 2.0 acres	400 00	
Pasture, 65.6 acres	1,049 50	
Waste and Miscellaneous, 10.6 acres	380 50	
Total, 266.7 acres	\$16,586 50	
Sewerage System	14,574 82	
Total		\$31,161 32

Buildings.

Institution Buildings	\$212,189 29	
Farm, Stable and Grounds	26,920 00	
Miscellaneous	88,678 73	
Total		327,788 02
Present value of all personal property as per inventory of November 30, 1929		\$358,949 34
		125,183 57
Grand Total		\$484,132 91

Financial Report, Westfield State Sanatorium, 1929.*To the Department of Public Health.*

I respectfully submit the following report of the finances of this institution for the fiscal year ending November 30, 1929.

STATEMENT OF EARNINGS.

Board of patients	—	
Private	\$6,631 00	
Cities and Towns	73,413 00	
	<hr/>	\$80,044 00
Personal Services:		
Labor of employees	—	
Reimbursement from Board of Retirement		28 05
Sales:		
Travel, Transportation and Office Expense	—	
Food	\$435 84	
Clothing and Materials	1,614 81	
Furnishings and Household Supplies	—	
Medical and General Care	321 50	
Heat, Light and Power	—	
Farm	1,380 02	
Garage, Stable and Grounds	—	
Repairs, Ordinary	—	
Repairs and Renewals	—	
Arts and Crafts Sales	486 70	
Sundries, storeroom	74 43	
Junk	24 50	
	<hr/>	4,337 80
Miscellaneous:		
Interest on bank balances	—	
Rents	—	
	<hr/>	—
Total Earnings for the year		\$84,409 85
Total cash receipts reverting and transferred to the State Treasurer		\$82,569 35
Accounts Receivable outstanding Dec. 1, 1928	\$19,469 57	
Accounts Receivable outstanding Nov. 30, 1929	21,310 07	
	<hr/>	
Accounts Receivable increased, (if decreased show in red ink)		\$1,840 50

MAINTENANCE APPROPRIATION.

Balance from previous year, brought forward		\$5,865 74
Appropriation, current year	\$258,900 00	
Supplementary Budget	2,200 00	
	<hr/>	
Total		\$266,965 74
Expenditures as follows:		
Personal Services	\$133,917 60	
Food	44,856 55	
Medical and General Care	7,645 34	
Farm	14,536 91	
Heat, Light and Power	14,862 24	
Garage, Stable and Grounds	3,922 67	
Travel, Transportation and Office Expenses	3,048 98	
Religious Instruction	1,244 80	
Clothing and Materials	3,958 72	
Furnishings and Household Supplies	9,611 14	
Repairs Ordinary	7,118 32	
Repairs and Renewals	8,636 04	
	<hr/>	
Total Maintenance Expenditures		\$253,359 31
Balance of Maintenance Appropriation, Nov. 30, 1929		\$13,606 43
Estimated outstanding Liabilities, Nov. 30, 1929		\$6,149 48

SPECIAL APPROPRIATIONS.

Balance December 1, 1928, brought forward		\$8,090 97
Appropriation for current year		10,700 00
	<hr/>	
Total		\$18,790 97
Expended during the year (see statement below)	\$6,050 35	
Reverting to Treasury of Commonwealth (star balances below that are reverting)	*.07	
	<hr/>	\$6,050 42
Balance November 30, 1929, carried to next year		\$12,740 55

APPROPRIATION.	Act or Resolve.	Total Amount Appropriated.	Expended during Fiscal Year.	Total Expended to Date.	Balance at End of Year.
*Swimming Pool	1928	\$4,400 00	\$166 00	\$4,399 93	\$0 07
Inst. Sprinklers	1928	4,000 00	3 00	1,621 75	2,378 25
Sewerage System	1928	7,739 30	4,715 87	6,911 52	827 78
Imp. Water Supply and Fire Protection	1929	10,700 00	1,165 48	1,165 48	9,534 52
	—	\$26,839 30	\$6,050 35	\$14,098 68	\$12,740 62

Balances reverting to Treasury (Balances to read)07 out
 Balance November 30, 1929 carried to next year as above \$12,740 55

PER CAPITA.

During the year the average number of patients has been 287 12
 Total cost of maintenance \$253,359 31
 Equal to a weekly per capita cost of (52 weeks to year) \$16.9695
 Total receipts for the year \$82,569 35
 Equal to a weekly per capita of \$5.5303
 Total net cost of Maintenance for year (total maintenance less total receipts) \$170,789 96
 Net weekly per capita \$11.4392

Respectfully submitted,

JOSEPHINE E. FRENCH,
Treasurer.

Statistical Tables.

TABLE 1. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Number of patients admitted Dec. 1, 1928, to Nov. 30, 1929, inclusive .	136	143	279
Number of patients discharged Dec. 1, 1928, to Nov. 30, 1929, inclusive .	130	156	286
Number of deaths (including those in previous items)	5	21	26
Number in Sanatorium Dec. 1, 1928	144	152	296
Number remaining November 30, 1929	150	139	289

TABLE 2. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	135	143	278
Married	1	—	1
	136	143	279

TABLE 3. — *Ages of Patients Admitted.*

	Males.	Females.	Totals.
1 to 13 years	97	90	187
14 to 20 years	38	53	91
40 to 60 years	1	—	1
	136	143	279

TABLE 4. — *Nativity and Parentage of Patients Admitted.*

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
United States:									
Massachusetts	105	42	46	111	31	35	216	73	81
Other N. E. States	7	10	9	5	11	11	12	21	20
Other States	5	10	7	10	5	5	15	15	12
Total Natives	117	62	62	126	47	51	243	109	113
Other Countries:									
Albania	1	2	2	1	1	1	2	3	3
Armenia	—	—	—	—	2	2	—	2	2
Austria	—	1	1	—	2	2	—	3	3
Australia	—	—	—	—	—	1	—	—	1
Azore Islands	—	1	—	—	2	2	—	3	2
Canada	9	18	26	6	25	24	15	43	50
Cape Verde	—	—	—	—	1	1	—	1	1

TABLE 4. — *Nativity and Parentage of Patients Admitted* — Concluded.

PLACES OF NATIVITY.	MALES.			FEMALES.			TOTALS.		
	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.	Patients.	Fathers.	Mothers.
Other Countries — <i>Concluded</i>									
England	1	6	5	—	2	2	1	8	7
Finland	1	3	3	2	3	3	3	6	6
Germany	1	1	1	—	1	1	1	2	2
Greece	—	—	—	—	1	1	—	1	1
Ireland	—	4	4	2	9	12	2	13	16
Italy	1	10	9	3	24	21	4	34	30
Norway	—	—	—	—	1	—	—	1	—
Poland	1	8	9	—	10	10	1	18	19
Portugal	—	1	1	—	1	1	—	2	2
Russia	2	7	6	1	3	3	3	10	9
Scotland	—	1	2	1	1	1	1	2	3
Spain	—	—	—	—	1	1	—	1	1
South America	—	2	—	—	—	—	—	2	—
West Indies	—	—	—	—	—	1	—	—	1
Sweden	—	1	1	—	—	—	—	1	1
Syria	1	1	1	—	2	2	1	3	3
	18	67	71	16	92	92	34	159	163
Unknown	1	7	3	1	4	—	2	11	3
	19	74	74	17	96	92	36	170	166
	117	62	62	126	47	51	243	109	113
	136	136	136	143	143	143	279	279	279

TABLE 5. — *Residence of Patients Admitted.*

Adams, 2	Hardwick, 1	Quincy, 15
Agawam, 1	Holbrook, 1	Revere, 1
Ashburnham, 1	Holden, 1	Rutland, 3
Ashland, 2	Holyoke, 7	Sharon, 3
Attleboro, 1	Hudson, 6	South Hadley, 1
Auburn, 1	Lee, 3	Somerville, 3
Barre, 1	Leominster, 2	Southbridge, 3
Belmont, 1	Lowell, 1	Springfield, 15
Boston, 56	Malden, 2	Stoneham, 3
Cambridge, 5	Marlborough, 1	Stoughton, 1
Canton, 2	Medford, 5	State Minor Wards, 10
Chelsea, 3	Melrose, 1	Taunton, 1
Chicopee, 12	Milbury, 1	Wakefield, 1
Easton, 1	Milton, 1	Waltham, 1
Fall River, 1	Montague, 2	Watertown, 1
Fitchburg, 21	Natick, 2	Webster, 1
Framingham, 1	Newton, 1	Westborough, 3
Franklin, 1	North Adams, 6	Westfield, 4
Gardner, 4	Northampton, 1	West Springfield, 4
Gloucester, 1	Northbridge, 1	Wilbraham, 3
Grafton, 1	Oxford, 1	Wilmington, 1
Great Barrington, 1	Palmer, 6	Winchester, 2
Greenfield, 2	Pittsfield, 4	Winthrop, 1
Hadley, 1	Provincetown, 1	Worcester, 17
		Total, 279

TABLE 6. — *Occupation of Cases Admitted.*

	Males.	Females.	Totals.
At Home	8	11	19
Attendant	1	—	1
Bell boy	1	—	1
Clerk	3	2	5
Factory	—	4	4
Farm	3	—	3
Messenger	1	—	1
Painter	1	—	1
Stenographer	—	1	1
Waiter	1	—	1
Laundry	—	1	1
School	117	124	241
	136	143	279

TABLE 7. — *Stages of Disease on Admission.*

	Males.	Females.	Totals.	Percentage.
No Disease	4	7	11	3.94
Malnutrition	16	21	37	13.26
Adenitis	—	1	1	.36
Hilum Tuberculosis	88	58	146	52.32
Minimal	7	15	22	7.88
Moderately Advanced	4	10	14	5.01
Advanced	6	20	26	9.31
Pulmonary Abscess	1	—	1	.36
Bronchiectasis	2	2	4	1.44
Pleurisy with Effusion	4	4	8	2.88
Keratitis	—	1	1	.36
Scoliosis	—	1	1	.36
Bronchopneumonia	—	1	1	.36
Tuberculous Empyema	—	1	1	.36
Pneumonia Convalescent	1	—	1	.36
Pott's Disease	1	—	1	.36
Osteomyelitis	1	—	1	.36
Unclassified	1	1	2	.72
	136	143	279	100.00

TABLE 8. — *Condition on Discharge.*

	Males.	Females.	Totals.	Percentage.
Apparently Well	21	26	47	16.43
Apparently Arrested	68	73	141	49.33
Improved	26	25	51	17.83
Unimproved	6	8	14	4.88
Not considered	4	3	7	2.44
Died	5	21	26	9.09
	130	156	286	100.00

TABLE 9. — *Deaths.*

DURATION OF DISEASE.	Males.	Females.	Totals.	LENGTH OF RESIDENCE AT SANATORIUM.		
				Males.	Females.	Totals.
Under 1 month	—	—	—	—	1	1
1 to 2 months	—	—	—	—	—	—
2 to 3 months	—	—	—	1	3	4
3 to 4 months	—	2	2	—	2	2
4 to 5 months	—	1	1	1	3	4
5 to 6 months	—	—	—	—	1	1
6 to 7 months	1	—	1	—	—	—
7 to 8 months	—	—	—	—	—	—
8 to 9 months	—	2	2	—	1	1
9 to 10 months	—	—	—	—	—	—
10 to 12 months	—	2	2	—	5	5
12 to 18 months	1	7	8	2	1	3
18 to 24 months	1	1	2	1	1	2
Over 2 years	2	6	8	—	3	3
	5	21	26	5	21	26

TABLE 10. — *Causes of Death.*

CAUSE.	Males.	Females.	Totals.
Pulmonary Tuberculosis	5	20	25
Purpura Hemorrhagica	—	1	1
	5	21	26

INVENTORY.

Real Estate.

Land, 266.7 acres	\$16,586 50
Buildings	327,788 02
Betterments (additions and improvements)	14,574 82
Total, Real Estate	\$358,949 34

Personal Property — Undistributed Supplies.

Travel, Transportation and Office Expenses (total of Departmental Sheets)	—
Food (total of Departmental Sheets)	\$4,397 07
Clothing and Materials (total of Departmental Sheets)	2,497 36
Furnishings and Household Supplies (total of Departmental Sheets)	2,883 42
Medical and General Care (total of Departmental Sheets)	519 80
Heat, Light and Power (total of Departmental Sheets)	4,274 80
Farm (total of Departmental Sheets)	1,384 94
Garage, Stable and Grounds (total of Departmental Sheets)	151 12
Repairs (total of Departmental Sheets)	39 69
Total	\$16,148 20

Personal Property — Distributed Supplies.

Travel, Transportation and Office Expenses (total of Departmental Sheets)	\$3,146 12
Clothing and Materials (total of Departmental Sheets)	783 41
Furnishings and Household Supplies (total of Departmental Sheets)	26,902 31
Medical and General Care (total of Departmental Sheets)	39,815 19
Heat, Light and Power (total of Departmental Sheets)	2,340 51
Farm (total of Departmental Sheets)	27,026 66
Garage, Stable and Grounds (total of Departmental Sheets)	6,868 37
Repairs (total of Departmental Sheets)	2,152 80
Total	\$109,035 37

Grand Summary.

Real Estate, Total	\$358,949 34
Personal Property — Undistributed Supplies, Total	\$16,148 20
Personal Property — Distributed Supplies, Total	109,035 37
	125,183 57
Grand Total	\$484,132 91

PONDVILLE HOSPITAL.

RESIDENT OFFICERS.

GEORGE M. SULLIVAN, M.D., *Superintendent.*
 VALMORE A. PELLETIER, M.D., *Assistant Superintendent.*
 CHARLES E. DUMAS, M.D., *Senior Physician.*
 ALFONSO A. PALERMO, M.D., *Assistant Physician.*
 VERONICA M. BEAUREGARD, R.N., *Superintendent of Nurses.*
 MARION MCKENZIE, *Principal Bookkeeper and Treasurer.*
 NEIL FOUNTAIN, *Social Service Worker.*
 ANNE D. McLAUGHLIN, *Laboratory Technician.*
 MAY E. DONOVAN, *Head Housekeeper.*
 ERNEST L. GAGE, *Chief Power Plant Engineer.*
 DANIEL DONOVAN, *Groundskeeper.*

NON-RESIDENT OFFICERS.

ERNEST M. DALAND, M.D., *Chief of Visiting Staff.*
 GRANTLEY W. TAYLOR, M.D., *Senior Physician (Surgeon).*
 HORATIO ROGERS, M.D., *Senior Physician (Surgeon).*
 RICHARD DRESSER, M.D., *Senior Physician (Radiologist).*
 SHIELDS WARREN, M.D., *Senior Physician (Pathologist).*
 WILLIAM LEWIS, M.D., *Senior Physician (Assistant Pathologist).*
 CARL H. ERNLUND, M.D., *Senior Physician (Laryngologist).*
 HENRY JACKSON, JR., M.D., *Senior Physician (Internist).*
 ARTHUR M. GREENWOOD, M.D., *Senior Physician (Dermatologist).*
 ROGER C. GRAVES, M.D., *Senior Physician (Urologist).*
 JOE VINCENT MEIGS, M.D., *Senior Physician (Gynecologist).*

JOHN S. HODGSON, M.D., *Senior Physician (Neurological Surgeon)*.
 RICHARD H. NORTON, D.M.S. *Senior Physician (Oral Surgeon)*.
 EMANUEL KLINE, D.M.D. (*Dentist*).
 JAMES C. HUDSON, M.S., *Physicist*.

Report of the Superintendent.

To Dr. GEORGE H. BIGELOW, *Commissioner, Department of Public Health*.

I have the honor to submit the third annual report of the Pondville Hospital (Norfolk), P. O. Wrentham, Massachusetts, for the year ending November 30, 1929.

During the year, for maintenance there was expended \$192,743.86, representing a gross weekly per capita cost of \$45.10. There were collected from miscellaneous sources \$42,921.80 (total of all collections). Of this sum, \$16,182.57 came from private sources; \$25,955.00 came from cities and towns; \$33.64 came from the State Board of Retirement; \$300.00, Electricity Fund Prison Colony; and from sales \$450.59.

Deducting the above total collections from the maintenance expense leaves a net expense of \$149,822.06, equivalent to a net weekly cost per capita of \$35.05.

Three hundred and sixty-six patients were supported by private funds, 170 by cities and towns, 55 by the State, leaving 65 settlements pending.

From special appropriations, funds have been expended as follows:

For hospital unit and out-patient department, authorized by Acts of 1929, Chapter 146 (\$78,000), \$19,629.54.

For Automatic Sprinklers, authorized by Acts of 1929, Chapter 146 (\$2,500), \$12.72.

For additional fire protection, authorized by Acts of 1928, Chapter 127 (\$14,000), \$4,973.70.

For improvements to sewer beds, authorized by Acts of 1929, Chapter 146 (\$1,200), \$1,187.88.

For care of radium, authorized by Acts of 1929, Chapter 146 (\$10,000), \$5,039.69.

On November 30, 1928, 80 patients remained in the hospital; during the year there were 656 admissions. Of these 136 represented readmissions. Patients were received from 120 cities and towns. Patients were received also from 7 other state institutions. 77 patients remained in the hospital at the end of the year.

Discharges during the year number 659; 6 were relieved; 282 improved; 118 same; 65 unimproved; and 188 died. There were 83 autopsies.

The average stay in the hospital was 46.83 days per patient. The smallest number in the hospital on any one day was 72; the largest number 93. The average number per day was 82.18.

The weekly clinic at the hospital was continued through the year with 49 clinics held. Visits to the clinic numbered 1,097, with an average attendance of 22.38. First visits to the clinic numbered 435. Other out-patient visits numbered 405. Of these, 15 were new patients.

One hundred and eighteen clinic patients subsequently entered the hospital.

X-Ray and Radium.—Diagnostic X-Ray plates taken 2,137; fluoroscopic examinations 148; X-Ray treatments given 2,027; radium treatments 429.

Operations.—There have been 399 operations. In addition there were esophagoscopy 1; cystoscopies 16; and prostoscopies 13.

Anesthesias.—An anesthetic was given 467 times.

Changes in Personnel.—During the year additions and changes in the visiting staff were made as follows:

Horatio Rogers, M.D., was appointed Assistant Visiting Surgeon.

Richard Dresser, M.D., Visiting Radiologist, succeeded Isaac Gerber, M.D., resigned.

William Lewis, M.D., Assistant Visiting Pathologist, succeeded Lawrence Sophian, M.D., resigned.

Carl H. Erlund, M.D., Visiting Laryngologist (formerly Assistant Visiting Laryngologist), succeeded D. Crosby Greene, M.D., resigned.

In September, the superintendent, Lyman Asa Jones, M.D., was transferred to the Department of Public Welfare and was succeeded by George M. Sullivan, M.D.

Dr. Valmore A. Pelletier, resident Senior Physician, was appointed assistant superintendent early in the year. In April, Dr. Charles E. Dumas was promoted from assistant physician to senior physician, and Dr. Alfonso A. Palermo was added to the staff as assistant physician.

On November 30th, the resignation of Miss Jennie F. I. Dixon as social service worker took effect and Miss Neil Fountain was appointed for this position.

Course for Nursing Attendants.—October 15th a twelve months' course for nursing attendants was opened. Four pupil attendants enrolled. In this course, housekeeping, elementary dietetics, and practical and theoretical work in bedside nursing for chronic and convalescent patients will be given.

COMMENTS.

During the past year, both the house and out-patient services have increased in activity. The house has been filled to capacity most of the time, with breast, cervix, and mouth cancer cases predominating. The out-patient department examined many other types of cases besides these. It has functioned as a diagnostic clinic and as a therapeutic clinic, especially in skin cancer. In addition to the above mentioned groups of cases, many unusual ones have visited the clinic.

The hospital has increased its number of operations, X-Ray treatments and radium treatments. Both the operating room and the X-Ray apparatus are in almost constant use. With the addition of a visiting surgeon, and treatment to alleviate pain by neuro-surgery, the number of operations is increasing, especially so, since more early cases are now being referred in which surgery is the indicated treatment. Insofar as the policy of the roentgenology department is one of heavy radiation, where radiation is the indicated treatment, the number of treatments and the details of careful control of such cases have correspondingly become greater.

In the laboratory, frozen sections have been used for immediate diagnostic purposes and blood chemistry is now routinely available. The addition of another resident physician has made it possible to keep better records than previously and in general to lend more assistance in the surgery and to radiation therapy.

Attention to dietary details, ultraviolet light therapy, and highly filtered radium treatment with needles containing small amounts of radium is now being anticipated.

The past year shows progress and the coming year promises more.

IMPROVEMENTS.

During the year the addition connecting the main building with Ward C was started and it is expected it will be ready for occupancy sometime in May. This will help to relieve the waiting list which has existed during the entire past year.

A walk has been laid from the main entrance to the hospital building and a waiting station is now under construction at the bus stop.

The sprinkler system has been installed for additional fire protection in the service building, Ward C, and the storeroom.

Much new apparatus has been installed in the laboratory and operating room.

During the fall, grading of the grounds was started and brush cut out around the hospital buildings and cottages.

A recreation hall has been asked for, which is very much needed at this particular institution.

ACKNOWLEDGMENTS.

It is a pleasure to acknowledge the work of the chaplains, Rev. Melville Shafer and Rev. Father Maguire, who have been untiring in their ministrations; and the cooperation of officers and employees of the hospital.

For your cooperation and counsel, I am deeply grateful.

Respectfully submitted,

GEORGE M. SULLIVAN, M.D.,
Superintendent.

POPULATION.

	Males.	Females.	Totals.
Number admitted during the year	309	347	656
Number discharged during the year	307	352	659
Number remaining in hospital at end of fiscal year	48	29	77
Daily average attendance (Number of inmates actually present during year)	47.45	34.73	82.18
Daily average number of officers and employees	47.28	39.36	86.64

Statistical Tables.

TABLE I. — *Admissions and Discharges.*

	Males.	Females.	Totals.
Patients in hospital December 1, 1928	46	34	80
Patients admitted December 1, 1928 to November 30, 1929, inclusive	309	347	656
Patients discharged from December 1, 1928 to November 30, 1929, inclusive	307	352	659
Patients remaining in hospital November 30, 1929	48	29	77
Daily average number of patients	47.45	34.73	82.18
Deaths (included in number discharged)	108	80	188

TABLE II. — *Readmissions.*

	Males.	Females.	Totals.
Total patients treated	355	381	736
Less old patients readmitted first time since December 1, 1928	22	48	70
Less other readmissions	68	68	136
Less patients in hospital December 1, 1928	46	34	80
Number new patients admitted from December 1, 1928 to November 30, 1929	219	231	450
Total number different patients treated from December 1, 1928 to November 30, 1929 inclusive	287	313	600

Tables following are based on number of NEW patients treated:

TABLE III. — *Civil Condition of Patients Admitted.*

	Males.	Females.	Totals.
Single	56	31	87
Married	108	130	238
Widowed	53	61	114
Divorced	2	6	8
Separated	—	3	3
Totals	219	231	450

TABLE IV. — *Age of Patients Admitted.*

	Males.	Females.	Totals.
Under 20 years	3	2	5
20 to 29 years	1	6	7
30 to 39 years	7	28	35
40 to 49 years	27	51	78
50 to 59 years	53	60	113
60 to 69 years	62	46	108
70 to 79 years	54	31	85
80 to 89 years	11	6	17
90 to 99 years	1	1	2
Totals	219	231	450

TABLE V. — *Nativity of Patients Admitted.*

	Males.	Females.	Totals.
United States	116	128	244
Albania	1	—	1
Armenia	1	1	2
Austria	—	2	2
Belgium	1	—	1
Canada	20	25	45
Denmark	1	—	1
England	20	18	38
Finland	3	2	5
France	3	9	12
Germany	2	2	4
Greece	1	1	2
Holland	—	1	1
Ireland	26	22	48
Italy	1	6	7
Lithuania	2	1	3

TABLE V. — *Nativity of Patients Admitted* — Concluded.

	Males.	Females.	Totals.
Norway	1	—	1
Poland	3	2	5
Portugal	4	2	6
Rumania	—	1	1
Russia	6	5	11
Scotland	1	2	3
Sweden	5	1	6
Syria	1	—	1
Totals	219	231	450

TABLE VI. — *Residence of Patients Admitted.*

Abington, 1	Lee, 1	Quincy, 10
Adams, 1	Leicester, 1	Raynham, 2
Amesbury, 2	Lenox, 1	Reading, 2
Arlington, 3	Leominster, 4	Revere, 2
Ashburnham, 2	Lexington, 2	Rockland, 1
Assonet, 1	Lowell, 9	Rowley, 1
Athol, 4	Ludlow, 1	Salem, 1
Attleboro, 12	Lynn, 16	Sandwich, 1
Barre, 1	Malden, 1	Saugus, 4
Boston, 71	Mansfield, 1	Sharon, 2
Bourne, 1	Marblehead, 3	Shrewsbury, 1
Brockton, 10	Marlborough, 1	Somerville, 3
Brookline, 2	Maynard, 1	Springfield, 1
Cambridge, 13	Medfield, 3	Stockbridge, 1
Carver, 1	Medford, 3	Stoneham, 1
Chelsea, 6	Medway, 1	Stoughton, 1
Chicopee, 4	Mendon, 1	Stow, 1
Clinton, 1	Methuen, 3	Taunton, 4
Concord, 1	Middleborough, 4	Templeton, 1
Danvers, 1	Milford, 3	Upton, 1
Dartmouth, 1	Millis, 1	Uxbridge, 3
Dudley, 1	Millville, 1	Wakefield, 1
Everett, 5	Montague, 1	Walpole, 6
Fall River, 10	Natick, 2	Waltham, 2
Fitchburg, 7	New Bedford, 11	Wareham, 1
Foxborough, 7	Newburyport, 1	Watertown, 4
Framingham, 2	Newton, 3	Webster, 2
Franklin, 6	Norfolk, 4	West Bridgewater, 1
Gardner, 8	North Adams, 1	Westport, 1
Grafton, 3	North Andover, 2	Westwood, 2
Great Barrington, 2	North Attleborough, 5	Weymouth, 3
Greenfield, 2	Northbridge, 1	Winchendon, 5
Hanover, 1	Norton, 1	Winchester, 1
Haverhill, 4	Norwood, 3	Winthrop, 1
Hingham, 1	Orleans, 1	Worcester, 20
Holbrook, 1	Peabody, 2	Wrentham, 5
Holliston, 1	Pembroke, 1	Providence, R. I., 1
Holyoke, 1	Phillipston, 1	Saylesville, R. I., 1
Hull, 1	Pittsfield, 6	
Lancaster, 1	Plainville, 1	Transient, 1
Lawrence, 13	Plymouth, 2	State Institutions, 21
		Total, 450.

TABLE VII. — *Occupation of Patients Admitted.*

	Males.	Fe- males.	Totals.		Males.	Fe- males.	Totals.
Baker	1	—	1	Master mechanic	1	—	1
Barber	2	—	2	Matron	—	1	1
Blacksmith	4	—	4	Mill worker	5	2	7
Boiler man	1	—	1	Moulder	2	—	2
Bookkeeper	—	1	1	Musician	—	1	1
Box maker	1	—	1	Newspaper mailer	1	—	1
Brakeman	1	—	1	Night watchman	1	—	1
Bricklayer	1	—	1	No occupation	2	6	8
Bulb maker	1	—	1	Nurse	—	1	1
Butcher	1	—	1	Oiler	1	—	1
Cabinet maker	1	—	1	Painter	10	—	10
Carder	2	—	2	Papermaker	1	—	1
Caretaker	5	—	5	Plumber	1	—	1
Carpenter	15	—	15	Policeman	2	—	2
Chairmaker	1	—	1	Porter	1	—	1
Chambermaid	—	1	1	Poultry dealer	—	1	1
Chauffeur	2	—	2	Poultry man	1	—	1
Clerk	1	2	3	Power machine operator	—	1	1
Cobbler	1	—	1	Presser (stocking mill)	—	1	1
Cook	1	4	5	Printer	2	—	2
Crossing tender	3	—	3	Quarry worker	1	—	1
Day worker	—	1	1	Reeler (woolen mill)	—	1	1
Domestic Nurse	—	2	2	Rubber worker	2	—	2
Drawer-in (cotton mil)	—	1	1	Repair workman (mill)	1	—	1
Dressmaker	—	4	4	Retired	1	—	1
Druggist	1	—	1	R.R. agent	1	—	1
Elevator operator	1	—	1	Salesman	4	—	4
Engineer	3	—	3	Saleswoman	—	1	1
Express messenger	1	—	1	Sailor	1	—	1
Factory inspector	1	—	1	Saw filer	1	—	1
Farmer	10	—	10	Seamstress	—	1	1
Fireman	2	—	2	School boy	1	—	1
Fisherman	2	—	2	Shoe inspector	1	—	1
Foreman	1	—	1	Shoe maker	6	—	6
Freight handler	1	—	1	Shoe stitcher	—	1	1
Fruit dealer	1	—	1	Shoe worker	1	2	3
Gardener	4	—	4	Spinner	1	—	1
Glass blower	1	—	1	Spooler (woolen mill)	—	1	1
Hair dresser	—	1	1	Stationery engineer	1	—	1
Hardwood finisher	1	—	1	Steam fitter	1	—	1
Harness maker	1	—	1	Stenographer	—	1	1
Hotel clerk	2	—	2	Steward	1	—	1
Housekeeper	—	4	4	Stock clerk	1	—	1
Houseman	1	—	1	Storekeeper (grocery store)	1	—	1
Housewife	—	162	162	Storekeeper	1	—	1
Housework	—	9	9	Stone cutter	2	—	2
Inmate	1	1	2	Sub-foreman (construction work)	1	—	1
Inspector	—	1	1	Tailor	1	—	1
Insurance clerk	1	—	1	Teacher	—	2	2
Janitor	4	—	4	Teamster	6	—	6
Jeweler	1	—	1	Telephone operator	—	2	2
Jewelry worker	1	—	1	Textile worker	1	—	1
Kitchen worker	2	—	2	Tower man	1	—	1
Laborer	32	—	32	Truckman	2	—	2
Lather	1	—	1	Waiter	3	—	3
Laundress	—	4	4	Watch repair man	1	—	1
Leather worker	3	—	3	Weaver	2	4	6
Linotype operator	—	1	1	Whip maker	1	—	1
Livery keeper	1	—	1	Wool sorter	1	—	1
Lumberman	1	—	1	Yard conductor	1	—	1
Machinist	8	—	8	X-Ray technician	1	—	1
Maid	—	1	1				
Manager	—	1	1				
Mason	1	—	1	Totals	219	231	450

TABLE VIII. — *Stage of Disease of Patients Admitted.*

	Males.	Females.	Totals.
Early	20	35	55
Moderately Advanced	73	65	138
Advanced	118	116	234
Pre-malignant	—	1	1
Non-malignant	6	12	18
Post operative	—	1	1
No pathology	2	—	2
No diagnosis	—	1	1
Totals	219	231	450

TABLE IX. — *Condition of Patients Discharged.*

	Males.	Females.	Totals.
Relieved	1	5	6
Improved	117	165	282
Same	56	62	118
Unimproved	25	40	65
Died (Autopsied 83)	108	80	188
Totals	307	352	659

Table X includes all new cases treated, both in and out-patients. In a few instances the same patient has been counted twice or more times, according to the varying conditions presented.

TABLE X. — *All New Cases Treated.*

	Males.	Females.	Totals.
Carcinoma:			
Breast	2	70	72
Buccal Cavity:			
Buccal Mucosa	4	1	5
Floor of Mouth	8	—	8
Jaw	2	—	2
Lip	23	2	25
Palate	3	—	3
Parotid	—	1	1
Throat	1	—	1
Tongue	21	3	24
Tonsil	9	—	9
Totals	71	7	78
Female Genital Organs:			
Cervix	—	54	54
Fundus	—	3	3
Ovary	—	1	1
Uterus	—	9	9
Vagina	—	2	2
Vulva	—	2	2
Totals	—	71	71
Male Genital Organs:			
Penis	2	—	2
Prostate	13	—	13
Testicle	1	—	1
Totals	16	—	16
Peritoneum, Intestines, Rectum, etc.:			
Anus	—	3	3
Cecum	1	2	3
Colon	3	1	4
Pylorus	1	—	1
Rectum	13	13	26
Sigmoid	4	—	4
Totals	22	19	41
Skin:			
Abdominal Wall	—	1	1
Chest Wall	1	—	1
Back	1	—	1
Canthus	—	3	5
Chin	—	1	6
Ear	—	—	3
Eyebrow	—	1	1
Eyelids	4	3	7
Face	27	7	34
Forehead	1	5	6
Hand	1	2	3
Leg	1	—	1
Mastoid Region	2	1	3
Neck	8	—	8
Nose	8	12	20
Scalp	1	—	1
Temple	—	1	1
Totals	65	37	102
Stomach, Liver, etc.:			
Epiglottis	2	—	2
Esophagus	13	2	15
Gall Bladder	—	1	1
Liver	2	1	3
Pancreas	1	1	2
Pharynx	4	—	4
Stomach	16	4	20
Totals	38	9	47

TABLE X. — *All New Cases Treated* — Concluded.

	Males.	Females.	Totals.
Urinary Organs:			
Bladder	7	—	7
Totals	7	—	7
Other Sites:			
Antrum	3	2	5
Axilla	1	—	1
Bronchial	1	—	1
Eye	1	—	1
Larynx	6	1	7
Lung	1	1	2
Mastoid Region	1	—	1
Mediastinum	1	—	1
Nose	2	—	2
Rib	1	—	1
Thyroid	—	1	1
Totals	18	5	23
Sarcoma:			
Left Ilium	1	—	1
Foot	1	—	1
Fibrosarcoma-parotid	1	—	1
Lymphosarcoma	1	—	1
Melanotic sarcoma (foot)	1	—	1
Melanotic sarcoma (orbit)	—	1	1
Totals	5	1	6
Non-Malignant Tumors:			
Fibroma	3	5	8
Lipoma	5	4	9
Papilloma	4	3	7
Cervical Polyp.	—	9	9
Breast	—	27	27
Thyroid	—	1	1
Benign Tumors	11	18	29
Totals	23	67	90
Miscellaneous:			
Myelogenous and Lymphatic Leukemia	1	1	2
Lymphoblastoma	8	5	13
Leukoplakia	3	—	3
Central Nervous System	1	2	3
Mixed Tumors of Salivary Glands	—	1	1
Totals	13	9	22
Other Diseases:			
Diseases of the Skin:			
Miscellaneous	10	27	37
Keratosis	19	16	35
Totals	29	43	72
Diseases of the Stomach	7	4	11
Diseases of the Intestines:			
Adhesions	—	1	1
Constipation	5	3	8
Diverticulitis	1	—	1
Duodenal Ulcer	3	1	4
Totals	9	5	14
Diseases of the Rectum and Anus	—	2	2
Diseases of the Liver and Gall Ducts	2	5	7
Diseases of the Bladder	5	1	6
Diseases of the Urethra	—	1	1
Diseases of the Ureter	4	—	4
Totals	4	1	5
Diseases of the Male Genital Organs	5	—	5
Diseases of the Female Genital Organs	—	58	58
Laceration of Cervix	—	2	2
Totals	—	60	60
Diseases of the Abdomen and Peritoneum	5	2	7
Diseases of the Ductless Glands	—	1	1
Other Conditions:			
No Disease	14	16	30
No Diagnosis	7	11	18
Not Cancer	85	80	165
Totals	106	107	213

REPORT OF THE DIVISION OF ADULT HYGIENE.

HERBERT L. LOMBARD, M.D., *Director*

During 1929 the work of the Cancer Section has continued along the lines of previous years. No new clinics have been opened, but the preliminary details for the establishment of one in Brockton have been nearly completed.

In April, 1929, the Department, with the co-operation of the Cancer Committee of the Massachusetts Medical Society and the Massachusetts Branch of the American Society for the Control of Cancer, furnished a graduate course in cancer to 211 physicians and 199 dentists. Clinics were held at the Boston hospitals, mornings and afternoons, on various aspects of the cancer problem.

In June, 1929, the Cancer Section became the Division of Adult Hygiene and the activities were extended to include all chronic diseases.

During July, August, and September an extensive field investigation of chronic disease was made in Brockton, Abington, Kingston, Pembroke, Holbrook, Greenfield, Amherst, and Shelburne Falls. This was accomplished by means of house-to-house canvasses in which many questions regarding the incidence and care of chronic diseases were asked. In addition to the field work, questionnaires were sent to physicians, hospitals, and nursing homes.

In the spring, a survey of the influenza epidemic was made in Great Barrington, Palmer, Nantucket, and Saugus. This was done in cooperation with the United States Public Health Service who conducted a similar survey in Boston.

Due to the increased amount of work along statistical, social service, and educational lines the office personnel has been increased from eleven to twenty.

CONFERENCES.

A conference for the cancer clinic committees was held at the Lowell General Hospital in October and one for the educational and social workers in Worcester in November. Both of these conferences were well attended.

EDUCATION.

The educational activities of the preceding year have been continued. Twenty-nine radio talks have been given and over 3,500 articles have been sent to newspapers. While many of these were not printed and material from the local cancer committee was often substituted, the amount of newspaper publicity received from the clipping bureau indicates that the Massachusetts newspapers have been most cooperative. Over 190,000 pamphlets have been distributed during the year.

There have been seventy-five public lectures delivered during the year, with an average attendance of ninety-five, omitting those given during the Graduate Course.

A lengthy pamphlet on adult hygiene is under preparation.

STUDIES.

The studies in which the Department has been interested during the past year have been as follows:

1. *Study of the Death Records from Cancer.*—The following conclusions have been reached:

(1) A sufficiently close correlation exists between the social classes in England and the nativity groups in Massachusetts in respect to the cancer death rate, to warrant the opinion that economic social conditions are a factor in the causation of cancer.

(2) The foreign born have much higher rates than the native born of native parents in cancers of the buccal cavity and the stomach.

(3) Cancer of the stomach is abnormally high among both males and females for all foreign born groups, and cancer of the buccal cavity among the Irish, English, and Teutons.

(4) Cancer of the lower intestinal tract in females is high among the Irish and English, while it is low among the Italians.

(5) The Canadians have a high rate for cancer of the uterus, and the Russians a low rate.

(6) Both the Italians and the Russians have low rates for cancer of the breast.

(7) The Irish and the Italians show higher rates in Boston than in their native countries.

(8) The sex ratio (females per male) is much higher for the native born of native parents than for any of the foreign nativity groups which have been studied in Boston and Europe.

(9) The Irish have slightly poorer diagnostic facilities than the other foreign groups, but the foreign born taken as a whole have sufficiently good diagnosis to eliminate the factor of diagnosis in discussing the high cancer death rate of the foreign born.

2. *Visiting Nurses' Questionnaires*. — Data is still being collected.

3. *Boston Dispensary Study*. — Partial tabulation of this data has been made.

4. *Massachusetts General Hospital Study*. — This study is nearly completed and will be published by Miss Ida M. Cannon. It shows the hospital rates for cancer by nativity. These differ considerably from the cancer death rates for the State.

5. *Lawrence Survey*. — Analysis of the data is under way.

6. *Cambridge Survey*. — The survey is nearly completed and the records have been partially analyzed.

7. *Wayland Survey*. — A report of the hospitalization problem was issued early in the year and studies on the morbidity are under way.

8. *Pondville Nativity Study*. — A study of cancer by the nativity of grandparents has been partially completed.

9. *Influenza Survey*. — The data obtained in a house-to-house influenza survey was analyzed and reported in the *New England Journal of Medicine*.

10. *Barbers' Survey*. — The data obtained in the barbers' survey was tabulated and analyzed.

11. *The Reason why Clinic Patients Delay*. — The social workers in the cancer clinics interviewed 221 cancer clinic patients to obtain the reason for their delay before consulting a physician and the delay between diagnosis and treatment. These records have been analyzed, together with information from cancer clinic records, and the results published in the October-November-December issue of the *Commonwealth*. The following conclusions have been made:

(1) The median delay between first symptoms and first consultation with a physician for individuals with cancer coming to the State-aided cancer clinics in Massachusetts is 6.5 months.

(2) The males delay longer than females except for skin cancers.

(3) The greatest delay is in cases of cancer of the skin and the shortest delay is among those patients having cancer of the uterus.

(4) Thinking the condition was a minor malady is the largest single cause of delay. Among the males, this reason is considerably greater than among the females.

(5) The greatest single cause of delay between consultation with physician and treatment was because of poor advice on the part of the attending physician.

(6) Forty-five per cent of the cancer patients had a median delay of six months after consulting a physician, while 55 per cent received treatment within a short time following diagnosis.

(7) The median interval of delay is increasing each year since our first figures in 1927. This is profoundly disappointing in view of the intensive medical and lay education carried on. Possibly it is in part due to the fact that the percentage of individuals with skin cancers attending the clinics has increased, as this group delays much longer than any other. Our current figures, however, indicate that the delay in skin cancers is increasing, while other types remain about the same.

12. *Increase of Chronic Disease*. — The death records from all causes from 1850 to 1920 have been studied and show:

(1) The population of Massachusetts has been gradually growing older.

(2) The crude death rate has decreased, but for age groups over fifty there has been an increase.

(3) Infections; tuberculosis; old age, ill-defined, and unknown; epilepsy, convulsions, and sudden death in individuals over fifty have a downward trend.

(4) Cancer, diabetes, heart, appendicitis, nephritis, and a group composed of leukemia, biliary calculi, diseases of the prostate, benign tumors of the uterus, and accidental gas have an upward trend which apparently is caused by factors other than errors in diagnosis and certification, public health activities, and changes in the people and their environments.

(5) All other diseases show an initial increase followed by a decrease. This trend gives the impression that it is caused by changes in the composition of the people and their living conditions.

13. *Chronic Disease Survey.*—The records of the house-to-house canvass, together with the information on the questionnaires received from physicians, hospitals, and nursing homes are being studied. From them we expect to get information regarding the volume of chronic disease in Massachusetts, how it is being cared for, and various factors regarding individual diseases, such as heredity, nativity, occupation, etc.

STATE-AIDED CANCER CLINICS.

During the year 1929, 2,106 individuals attended the State-aided cancer clinics in Massachusetts. Five hundred and thirty-four of this number had cancer and 147 had precancerous conditions. The attendance at the cancer clinics in 1929 has been less than in 1928, but the percentage of cancers has increased, while the percentage of precancerous conditions has remained about the same. The falling off in clinic attendance is largely confined to conditions other than cancer, as the number of cancer cases in the two years is nearly identical. (Table I.)

Table II shows the attendance rate at State-aided cancer clinics for the cities and towns in Massachusetts which had ten or more of their inhabitants coming to the clinics. The towns around Pondville have the highest rate, while Lowell and Lynn have the highest rates for the clinic cities.

The State-aided cancer clinics having the largest attendance are Pondville, Lowell, Lynn, and the Boston Dispensary. The percentage of cancers is high in the Pondville and Boston Dispensary clinics and low in the Lowell and Berkshire clinics. Both the Boston Dispensary and the Lowell clinics have rather a large percentage of deferred cases. (Table III.)

The median duration between first symptoms and first visit to a physician for cancer patients increased from 6.1 months in 1928 to 6.6 months in 1929. The delay between first symptoms and first visit to a cancer clinic for cancer patients has also increased. On the other hand, the delay between first symptoms and first visit to physicians for precancerous conditions decreased from 11.0 months in 1928 to 8.8 months in 1929, and the delay before visiting cancer clinics also decreased. It is encouraging to find that the patients with precancerous conditions are seeking advice at an earlier period, but the increase in the delay of the patients with cancer indicates that further educational activities must be conducted to induce these patients to seek advice at an earlier stage in their disease. (Table IV.)

Skin cases show the longest delay before coming to the cancer clinics for both years. As we are getting more cases of skin cancer each year, this may be the cause for a part of the increase in the median duration of delay. The patients with cancer of the uterus come to the clinic at an earlier period than do those with cancer of the breast. (Table V.)

In 1929 a larger number of patients came to the clinics at the advice of physicians than in 1928, and a smaller number came because of newspaper publicity. In both years physicians referred over one-half of the individuals with cancer. (Table VI.)

The reasons for coming to the clinic varied in the different communities. The Berkshire clinic had the largest percentage of cases referred by newspapers, the Pondville clinic had the largest number referred by physicians, and the Lowell clinic had the largest number of cases referred by friends and relatives. (Table VII.)

When the cancers were divided into their various locations, it was found that physicians sent the largest percentage for all types for both years. The second largest percentage for cancer of the buccal cavity and oesophagus was friends and relatives in 1929 and newspapers in 1928. The second largest percentage for cancer of the stomach was past experience in 1929 and an equal percentage for newspapers and friends and relatives in 1928. The second largest percentage for cancer of other digestive tract was past experience in 1929 and an equal percentage for social service and friends and relatives in 1928. The second largest percentage for cancer of the uterus, cancer of the skin, and cancer of the breast was newspapers in both years. The second largest percentage for cancer of all other organs was newspapers and past experience in 1929 and newspapers in 1928. (Table VIII.)

Cancer of the buccal cavity, uterus, skin, and breast constituted the majority of the cancer cases in the clinics. The percentages of skin cancers and uterine cancers have increased each year, while those of breast and buccal cavity have fallen off. Cancer of the stomach, which is the largest single cause of death from this disease, has only a small percentage of cases at the clinic. (Table IX.)

About one-fifth of the patients with cancer had never consulted a physician before coming to the State-aided cancer clinics. About one-fourth of all the breast cases, nearly one-third of all the skin cases, and about one-fifth of the buccal cavity cases had seen no physician. The percentages for these diseases are higher than in 1928. (Table X.)

In 1929 the symptoms which brought patients to cancer clinics were similar to 1928. There was an increase in the number who came as a result of swelling and a slight decrease in those who came as a result of pain. The percentages of cancer and precancerous patients who came with pain as a symptom are much lower than those in the other groups in both years. This again emphasizes the statement that pain is rarely a symptom in early cancer. (Table XI.)

There is not much difference in the nativity distribution of patients by clinics in the two year study. (Table XII.)

About one-third of the cancer patients were recommended to have an operation; about one-half radiation. The percentage advised to have operation is less than in 1928, while the percentage of those advised to have radiation is larger. (Table XIII.)

In 1929 more patients were advised to have treatment at the cancer clinics than in 1928, but fewer patients were advised to have treatment at Pondville. Skin cancer was the type most frequently referred to the cancer clinics for treatment. A larger percentage of cancer of the digestive tract was referred to Pondville than of any other type of cancer, and a larger percentage of uterine cancer was referred to local hospitals than of any other type of cancer. (Table XIV.)

The cancer rates by occupation for those occupations having ten or more individuals attending the clinics show that students, stenographers, and infants have low rates; carpenters, laborers, farmers, and retired have high rates; and the majority of occupations have medium rates. The chance fluctuations are large and the difference between many of the groups is insignificant. (Table XV.)

TABLE I. — *Attendance at State-Aided Cancer Clinics.*

	MALES.		FEMALES.		TOTALS.	
	1928.	1929.	1928.	1929.	1928.	1929.
Attendance	852	758	1,692	1,348	2,544	2,106
Cancer	251	274	275	260	526	534
Precancerous	87	56	76	91	163	147
Other conditions	413	365	1,058	824	1,471	1,189
Deferred diagnosis	75	28	158	80	233	108
Normal	26	35	125	93	151	128
Per cent with cancer	29.4	36.1	16.2	19.3	20.6	25.4
Per cent with precancer	10.2	7.4	4.5	6.8	6.4	7.0
Median age of clinic attendance	58.4	56.3	41.5	47.6	49.0	50.4
Median age of cancer patients	64.5	64.9	54.1	58.2	60.5	61.7

TABLE II. — *Residents of Massachusetts Cities and Towns attending State-Aided Cancer Clinics.*

Number of places with 1 patient	66
Number of places with 2-5 patients	77
Number of places with 6-9 patients	19
Number of places with 10 patients and over	36
Total number of places	198

Places with Ten Patients and Over in 1929.

	RATE PER 1,000.	
	1929.	1928.
Wrentham	10.0	9.4
Norfolk	9.1	6.6
Foxborough	7.9	7.3
Walpole	5.4	4.9
Tewksbury	4.4	3.4
Franklin	3.4	3.7
Medfield	3.1	3.9
Dracut	2.8	2.0
Lowell	2.7	3.5
North Attleborough	2.5	1.7
Lynn	1.7	2.8
Saugus	1.6	3.4
Chelmsford	1.5	3.0
Greenfield	1.5	2.4
Attleboro	1.5	1.6
Gardner	1.4	3.6
Grafton	1.4	1.0
Montague	1.4	0.5
New Bedford	1.0	1.9
Pittsfield	1.0	0.6
Fitchburg	0.9	2.4
Norwood	0.9	1.8
Leominster	0.9	2.6
Amesbury	0.9	0.4
Methuen	0.8	0.5
Lawrence	0.8	0.5
Springfield	0.7	0.6
Worcester	0.7	0.7
North Adams	0.6	1.2
Taunton	0.4	0.5
Chicopee	0.3	0.3
Brockton	0.3	0.2
Salem	0.3	0.2
Haverhill	0.3	— ¹
Boston	0.2	0.1
Cambridge	0.1	0.1

¹ Less than .05 per 1,000.

TABLE VII. — *Reasons for Coming to Clinic, by Individual Clinic, 1929.*¹

[Rate per 100.]

CLINIC.	Newspapers.	Physicians.	Friends and Relatives.	Others.
Berkshire	69.7	16.9	11.2	9.0
Boston Dispensary	6.7	22.6	23.6	47.5
Franklin County	28.9	61.5	5.8	3.8
Lawrence	52.8	25.2	13.0	13.0
Lowell	48.6	18.0	29.0	4.8
Lynn	49.8	22.4	14.9	12.9
New Bedford	49.7	30.3	11.6	8.4
Newton	50.0	50.0	0.0	0.0
Pondville	3.1	70.8	16.7	9.4
Springfield	57.6	10.8	20.2	12.0
Worcester	26.4	49.3	5.6	19.4
Worcester North	61.5	19.3	12.8	7.3
Total	35.4	34.3	17.4	13.6

¹ Does not total to 100 per cent, as some individuals gave more than one reason.

TABLE IX. — *Location of Cancer.*

[Rate per 100.]

LOCATION OF CANCER.	MALES.			FEMALES.			TOTALS.		
	1927.	1928.	1929.	1927.	1928.	1929.	1927.	1928.	1929.
Buccal and Oesophagus	43.8	39.9	36.1	6.9	5.5	5.8	23.8	21.9	21.3
Stomach	4.1	3.4	3.3	2.9	0.8	0.8	3.4	2.0	2.1
Liver	0.0	0.3	0.4	0.6	0.3	0.4	0.3	0.3	0.4
Other Digestive Tract	6.2	3.1	3.3	2.3	2.1	3.1	4.1	2.6	3.2
Uterus	0.0	0.0	0.0	14.9	17.1	22.3	8.2	8.9	10.9
Skin	37.0	43.7	47.4	23.7	29.2	30.4	29.8	36.1	39.1
Breast	2.0	0.9	0.7	37.0	29.2	26.5	21.0	15.7	13.3
All Others	6.9	8.6	8.8	11.6	15.8	10.8	9.4	12.4	9.7

TABLE X. — *Contact of Cancer Patients with Physician, by Location of Cancer.*

[Rate per 100.]

LOCATION OF CANCER.		No Physician.	One Physician.	Two or More Physicians.
Buccal and Oesophagus	{ 1928	16.7	48.3	35.1
	{ 1929	19.6	50.0	30.4
Stomach	{ 1928	7.1	64.3	28.6
	{ 1929	0.0	27.3	72.7
Liver	{ 1928	0.0	50.0	50.0
	{ 1929	0.0	50.0	50.0
Other Digestive Tract	{ 1928	6.7	53.3	40.0
	{ 1929	12.5	56.3	31.2
Uterus	{ 1928	14.9	46.8	38.3
	{ 1929	10.5	56.2	33.3
Skin	{ 1928	20.2	47.9	31.9
	{ 1929	30.7	43.9	25.4
Breast	{ 1928	20.0	55.6	24.4
	{ 1929	23.2	40.6	36.2
All Others	{ 1928	20.7	43.1	36.2
	{ 1929	9.6	48.1	42.3
Total	{ 1928	18.1	49.3	32.6
	{ 1929	21.8	46.5	31.7

TABLE XI. — *Symptoms that Brought Patient to Clinic, by Diagnosis.*¹

[Rate per 100.]

DIAGNOSIS.	CANCER.		PRECANCEROUS.		OTHER CONDITIONS.		DEFERRED.		NORMAL.		TOTAL.	
	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.
Swelling	36.3	44.7	31.3	42.8	38.2	43.2	21.5	35.2	31.1	35.2	35.4	42.7
Ulceration	31.6	27.1	22.7	16.3	7.2	6.4	5.2	4.6	6.0	6.3	13.0	12.3
Discharge	14.4	15.2	6.1	9.5	11.7	12.1	16.3	19.4	10.6	8.6	12.3	12.9
Pain	24.9	24.1	11.7	12.2	49.5	45.9	55.8	63.0	51.6	38.3	42.7	38.5
Deformity	2.1	2.2	3.1	3.4	0.9	1.9	1.7	1.9	0.0	2.3	1.3	2.1
Loss of Weight	8.9	8.1	1.8	1.4	10.8	8.2	18.0	13.9	8.6	7.8	10.4	7.9
Malaise	5.1	7.3	1.8	3.4	9.4	7.3	13.6	9.3	7.3	7.0	8.1	7.1
Bleeding	9.7	12.2	4.3	10.9	5.0	5.8	12.0	13.9	6.0	3.1	6.6	8.0
Itching	4.6	10.3	6.1	10.2	5.3	6.1	2.0	1.9	7.3	5.5	5.1	7.2
Scaly Skin	7.2	6.0	22.7	22.4	3.0	3.2	1.7	4.6	0.7	2.3	4.9	5.4
Unknown or None	1.5	2.1	2.5	2.0	2.5	1.9	4.3	0.0	7.3	7.8	2.8	2.2
Others	0.6	0.4	4.3	0.7	0.3	0.4	0.9	0.0	0.7	2.3	0.7	0.5

¹ Does not total to 100 per cent, as multiple symptoms were given by some patients.

TABLE XII. — *Nationality of Individual, by Individual Clinic.*

[Rate per 100.]

CLINIC.	United States.	Ireland.	Russia-Poland.	Italy.	Britain.	Teutonic.	Scandinavia.	Latin.	French Canada.	Other Canada.	Baltic.	Others.	Unknown.
Berkshire	{ 1928 58.9	{ 1928 7.8	{ 1928 5.6	{ 1928 7.8	{ 1928 2.2	{ 1928 3.3	{ 1928 0.0	{ 1928 7.8	{ 1928 3.3	{ 1928 2.2	{ 1928 0.0	{ 1928 1.1	{ 1928 0.0
Boston Dispensary	{ 1929 75.2	{ 1929 5.6	{ 1929 4.5	{ 1929 1.1	{ 1929 3.4	{ 1929 1.1	{ 1929 1.1	{ 1929 0.0	{ 1929 2.3	{ 1929 2.3	{ 1929 0.0	{ 1929 1.1	{ 1929 2.3
Franklin County	{ 1928 48.1	{ 1928 12.5	{ 1928 11.0	{ 1928 0.0	{ 1928 8.2	{ 1928 0.0	{ 1928 1.4	{ 1928 1.4	{ 1928 2.7	{ 1928 8.2	{ 1928 1.4	{ 1928 1.4	{ 1928 0.0
Lawrence	{ 1929 82.9	{ 1929 2.6	{ 1929 5.3	{ 1929 5.3	{ 1929 4.3	{ 1929 1.4	{ 1929 0.5	{ 1929 0.0	{ 1929 2.9	{ 1929 9.1	{ 1929 1.3	{ 1929 1.0	{ 1929 1.9
Lowell	{ 1928 90.5	{ 1928 0.0	{ 1928 3.8	{ 1928 0.0	{ 1928 3.3	{ 1928 3.3	{ 1928 0.0	{ 1928 0.0	{ 1928 0.0	{ 1928 0.0	{ 1928 0.0	{ 1928 0.0	{ 1928 0.0
Lynn	{ 1929 44.8	{ 1929 8.7	{ 1929 4.4	{ 1929 8.7	{ 1929 1.9	{ 1929 3.8	{ 1929 1.5	{ 1929 1.5	{ 1929 10.1	{ 1929 4.3	{ 1929 2.9	{ 1929 0.0	{ 1929 0.0
New Bedford	{ 1928 42.4	{ 1928 8.4	{ 1928 6.5	{ 1928 3.3	{ 1928 8.9	{ 1928 8.9	{ 1928 0.8	{ 1928 0.0	{ 1928 13.8	{ 1928 3.3	{ 1928 0.8	{ 1928 0.0	{ 1928 0.0
Newton	{ 1929 49.5	{ 1929 9.0	{ 1929 2.0	{ 1929 0.3	{ 1929 4.5	{ 1929 1.5	{ 1929 1.1	{ 1929 7.5	{ 1929 17.4	{ 1929 5.5	{ 1929 1.1	{ 1929 2.4	{ 1929 0.0
Pondville	{ 1928 59.6	{ 1928 6.6	{ 1928 4.8	{ 1928 1.6	{ 1928 3.4	{ 1928 0.3	{ 1928 0.6	{ 1928 0.0	{ 1928 22.1	{ 1928 6.4	{ 1928 0.6	{ 1928 1.1	{ 1928 0.0
Springfield	{ 1929 60.5	{ 1929 6.2	{ 1929 3.5	{ 1929 1.6	{ 1929 5.5	{ 1929 1.2	{ 1929 0.8	{ 1929 0.4	{ 1929 1.2	{ 1929 14.8	{ 1929 1.3	{ 1929 1.6	{ 1929 0.0
Worcester	{ 1928 42.4	{ 1928 2.5	{ 1928 1.4	{ 1928 0.7	{ 1928 16.4	{ 1928 0.0	{ 1928 0.0	{ 1928 17.1	{ 1928 16.4	{ 1928 2.1	{ 1928 0.4	{ 1928 0.0	{ 1928 0.8
Worcester North	{ 1929 45.8	{ 1929 3.9	{ 1929 3.9	{ 1929 0.0	{ 1929 19.4	{ 1929 1.9	{ 1929 1.3	{ 1929 9.0	{ 1929 11.0	{ 1929 2.1	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0
Worcester	{ 1928 42.9	{ 1928 7.1	{ 1928 0.0	{ 1928 7.1	{ 1928 7.1	{ 1928 0.0	{ 1928 7.1	{ 1928 0.0	{ 1928 7.1	{ 1928 21.4	{ 1928 0.0	{ 1928 0.0	{ 1928 0.0
Worcester South	{ 1929 50.0	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0	{ 1929 50.0	{ 1929 0.0	{ 1929 0.0	{ 1929 0.0
Worcester	{ 1928 64.0	{ 1928 6.3	{ 1928 2.1	{ 1928 1.9	{ 1928 5.4	{ 1928 1.9	{ 1928 3.5	{ 1928 0.8	{ 1928 6.3	{ 1928 5.2	{ 1928 0.4	{ 1928 2.1	{ 1928 0.0
Worcester	{ 1929 66.2	{ 1929 6.0	{ 1929 0.9	{ 1929 0.0	{ 1929 5.8	{ 1929 1.8	{ 1929 2.9	{ 1929 0.5	{ 1929 4.5	{ 1929 7.4	{ 1929 0.2	{ 1929 1.1	{ 1929 0.5
Worcester	{ 1928 69.3	{ 1928 3.6	{ 1928 5.0	{ 1928 2.2	{ 1928 5.7	{ 1928 0.7	{ 1928 0.6	{ 1928 0.7	{ 1928 7.1	{ 1928 5.0	{ 1928 0.0	{ 1928 2.9	{ 1928 0.0
Worcester	{ 1929 73.3	{ 1929 4.4	{ 1929 4.3	{ 1929 1.9	{ 1929 5.0	{ 1929 0.6	{ 1929 0.6	{ 1929 1.2	{ 1929 5.0	{ 1929 2.5	{ 1929 0.0	{ 1929 1.2	{ 1929 0.0
Worcester	{ 1928 59.7	{ 1928 9.4	{ 1928 4.4	{ 1928 3.3	{ 1928 2.2	{ 1928 2.2	{ 1928 5.0	{ 1928 0.6	{ 1928 6.6	{ 1928 1.7	{ 1928 1.7	{ 1928 3.3	{ 1928 0.0
Worcester	{ 1929 64.3	{ 1929 6.2	{ 1929 2.1	{ 1929 4.1	{ 1929 4.1	{ 1929 0.7	{ 1929 4.1	{ 1929 0.7	{ 1929 7.5	{ 1929 2.7	{ 1929 2.1	{ 1929 0.7	{ 1929 0.7
Worcester	{ 1928 52.1	{ 1928 2.0	{ 1928 2.3	{ 1928 2.0	{ 1928 3.3	{ 1928 0.7	{ 1928 1.0	{ 1928 1.0	{ 1928 17.6	{ 1928 5.2	{ 1928 12.7	{ 1928 0.3	{ 1928 0.0
Worcester	{ 1929 48.7	{ 1929 0.9	{ 1929 0.9	{ 1929 0.9	{ 1929 4.6	{ 1929 1.8	{ 1929 1.8	{ 1929 0.0	{ 1929 13.8	{ 1929 1.8	{ 1929 23.9	{ 1929 0.9	{ 1929 0.0
Total	{ 1928 54.8	{ 1928 6.1	{ 1928 4.0	{ 1928 1.7	{ 1928 6.3	{ 1928 1.2	{ 1928 1.7	{ 1928 3.9	{ 1928 10.5	{ 1928 6.0	{ 1928 2.3	{ 1928 1.7	{ 1928 0.0
	{ 1929 58.6	{ 1929 6.6	{ 1929 3.5	{ 1929 1.9	{ 1929 6.1	{ 1929 1.7	{ 1929 1.5	{ 1929 1.7	{ 1929 8.5	{ 1929 6.7	{ 1929 1.8	{ 1929 0.9	{ 1929 0.5

TABLE XIII. — *Type of Treatment Recommended, by Organ Affected.*¹

[Rate per 100.]

ORGAN AFFECTED.		Operation.	Radiation.	Operation and Radiation.	Observation.	No Advice.	Unknown.
Buccal and Oesophagus .	{ 1928	41.2	50.4	6.7	0.0	3.4	0.8
	{ 1929	35.1	54.4	5.3	3.5	2.6	0.0
Stomach	{ 1928	28.6	21.4	7.2	0.0	42.8	0.0
	{ 1929	27.3	27.3	0.0	9.1	36.3	0.0
Liver	{ 1928	0.0	0.0	0.0	0.0	100.0	0.0
	{ 1929	0.0	50.0	0.0	0.0	50.0	0.0
Other Digestive Tract .	{ 1928	58.8	29.4	5.9	0.0	0.0	5.9
	{ 1929	47.0	17.7	23.5	0.0	5.9	5.9
Uterus	{ 1928	22.0	66.0	4.0	0.0	6.0	4.0
	{ 1929	13.8	72.4	3.5	1.7	6.9	1.7
Skin	{ 1928	47.4	52.0	2.3	0.0	0.0	0.6
	{ 1929	34.4	61.3	2.4	1.4	0.5	0.0
Breast	{ 1928	62.0	22.8	12.0	0.0	1.1	2.2
	{ 1929	56.4	32.4	8.4	1.4	0.0	1.4
All Others	{ 1928	19.7	64.0	8.2	0.0	6.6	3.2
	{ 1929	36.5	38.5	9.6	3.9	9.6	1.9
Total	{ 1928	42.6	47.5	6.1	0.0	3.8	1.7
	{ 1929	35.6	52.7	5.2	2.2	3.6	0.7

¹ Does not total to 100 per cent, as in some cases more than one type of treatment was recommended.TABLE XIV. — *Recommendation for Place of Treatment for Cancer Patients, by Location of Cancer.*

[Rate per 100.]

LOCATION OF CANCER.		Pondville.	Local Hospital.	Other Institutions.	Local Physician.	Clinic.	Unknown.
Buccal and Oesophagus .	{ 1928	46.2	18.5	14.3	15.1	5.9	0.0
	{ 1929	39.5	19.3	9.6	15.8	15.8	0.0
Stomach	{ 1928	42.9	28.6	0.0	14.3	7.1	7.1
	{ 1929	27.3	27.3	9.1	27.3	9.1	0.0
Liver	{ 1928	0.0	100.0	0.0	0.0	0.0	0.0
	{ 1929	0.0	0.0	100.0	0.0	0.0	0.0
Other Digestive Tract .	{ 1928	53.0	29.4	17.6	0.0	0.0	0.0
	{ 1929	47.0	35.3	5.9	5.9	0.0	5.9
Uterus	{ 1928	46.0	34.0	8.0	4.0	4.0	4.0
	{ 1929	36.2	44.8	1.7	5.2	8.6	3.5
Skin	{ 1928	42.7	17.5	14.0	16.4	9.4	0.0
	{ 1929	21.5	18.2	16.3	13.9	29.6	0.5
Breast	{ 1928	34.8	35.8	4.3	19.6	2.2	3.3
	{ 1929	28.2	36.6	8.5	21.1	5.6	0.0
All Others	{ 1928	37.7	31.2	13.1	13.1	3.3	1.6
	{ 1929	30.8	26.9	7.7	17.3	13.5	3.8
Total	{ 1928	42.0	25.1	11.4	14.5	5.7	1.3
	{ 1929	29.6	25.3	11.2	14.6	18.2	1.1

TABLE XV. — *Cancer Morbidity Rate in State-Aided Cancer Clinics, by Occupation.*

OCCUPATION.	Rate per 1,000.
Student	31.8± 22.1
Stenographer	66.7± 64.4
Infant	71.4± 68.8
Painter	158.0± 83.7
Janitor and Janitress	176.4± 92.5
Policeman	181.8± 116.2
Clerk	195.1± 61.9
Housewife	196.6± 12.7
Salesperson	200.0± 80.0
At home	205.0± 64.7
Machinist	210.5± 93.5
Shoe worker	227.0± 63.1
Dressmaker	235.5± 103.0
Weaver	250.0± 81.9
Mill worker	256.0± 66.5
Nurse	294.0± 110.5
All Others	297.5± 21.1
Unknown	417.0± 142.3
Carpenter	421.0± 80.1
None	473.0± 114.0
Farmer	500.0± 85.7
Laborer	535.0± 68.5
Retired	567.0± 52.4

MASSACHUSETTS STATISTICS FOR 1929.

Estimated population	4,380,488
Death rate per 1,000 population	11.9
Infant mortality (per 1,000 live births)	62.0

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